Summer Training at
Centre for Sustainable Agriculture
Wardha
(April 9-June 1, 2012)

Farmer's Perception on Climate Change and Its Possible Impact on Agriculture in Vidarbha Region

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This is to certify that Rajesh Kumar Prasad has undergone summer training in **Centre For Sustainable Agriculture at Wardha** from 9th April to 01st June, 2012.

The candidate carried out all the studies related to summer training himself. His approach to the studies has been sincere, scientific, and analytical. This summer training in partial fulfillment of the course requirement is recommended for the award of Post Graduate Diploma in Rural Management.

I wish his success in all future endeavors.

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Table of Abbreviations

ADO	Agriculture Development officer
AP	Andhra Pradesh
CSA	Centre for Sustainable Agriculture
FAO	Food and Agriculture Organization
FCRA	Foreign Contribution Regulation Act
FGD	Focus Group Discussion
GOVT.	Government
ha.	Hectare
HRD	Human Resource Department
IIhmr	Indian Institute of Health Management and Research
LPG	Liquid Petroleum Gas
mm	Millie meter
NGO	Non Government Organization
NPM	Non Pesticides Management
PRA	Participatory Rural Appraisal
VRC	Village Resource Centre

Executive Summary

The purpose of this study was to understand the impact of climate change on Agriculture in Vidarbha region. It develops estimate of potential economic, livelihood, crop production, natural resources, health issues and livestock impacts due to climate change in the absence of adaptation actions.

In the Vidarbha region of Maharashtra more than 30,000 farmers committed suicides during the last decade out of which more than 70 percent farmers belong to the 11 districts of Vidarbha region. This is mainly because of the decreased soil fertility, lack of ample amount of irrigation water resources, lack of new technologies etc.

Agriculture in Vidarbha region is based on rain fed agriculture production system. Changes in rainfall pattern and proportion of rainfall are falling in consecutive years and it could have severe impact on agriculture production. Less rainfall in the maturing stage of crops and sometimes excess smog reduce growth and provide conditions that promote plant pests and disease that affects production of many crops.

Excess use of Chemical fertilizers and pesticides are affecting not only soil but it is indirectly affecting our environment (Ozone layer).Some agriculture crops are already showing signs of stress under current climatic conditions. Water scarce areas that depend entirely on rain water and ground water sources are experiencing severe water shortage. These problems will be aggravated by any further changes to current climate conditions. Non Pesticide Management can be a cost effective coping mechanism.

In order to achieve this objective two stages were identified – Data collection stage and analysis stage. The first stage includes data collection from various sources regarding the following-

1. The State and District profile of region.
2. Collection of secondary data from various agriculture departments and CSA Baseline reports.
3. Preparation of questionnaire.
4. Collection of primary data from villages (Questionnaire, Focussed Group Discussion and Participatory Rural Appraisal)

The analysis stage includes analysis of collected data, Interpretation and pertinence of data collected and extracting conclusions about the views and perceptions of farmers on this issue.

In this study we found that in climate there were many changes in last 5 to 15 years. Majority of farmers observed that there is increase in temperature and decrease in rainfall. There were mixed response on crop yield some observed increase and some observed decrease in crop yield but majority of them observed increase in pest attack and diseases. Pests like Churada, Murada (Sucking pests), Army worm, White Fly,

Bollworm, Untalli, American bollworm and pest diseases like Redding of leaves, Scorching of leaves and Wilting are severely affecting crop yield.

According to farmers' reason behind increase in pest are increase in temperature, humidity, cloudy environment, BT cotton, chemical fertilizers and pesticides and research varieties.

Majority of farmers were not involved in fodder production and water availability for irrigation was high to medium. Around 50 percent respondent famers were dependant only on rain fall for agriculture. Interestingly nearly 50 percent farmers were not involved in any kind of rain water harvesting activity. There was a government scheme for doing farm bunding; it was a good scheme but still nearly 50 percent farmers don't practice such things, so it is a little worry factor. Farmers also want a subsidy scheme on this.

In Yavatmal district there are no such practices available, if these schemes will be made available in this region, crop production will increase and farmers will produce new crops also.

Chapter 1

Introduction

Climate is changing naturally at its own pace, since the inception of the evolution of earth, four–five billion years ago**,** presently but it has gained currency and momentum on account of inadvertent anthropogenic disturbances. This rapidly changing phenomenon may culminate in adverse impact on human health and biosphere on which we depend. The multi-faceted interactions among humans, microbes and the rest of the biospheres have started reflecting quantum increase in the concentration of the green house gases i.e. Carbon dioxides, Methane and Nitrous Oxides, causing warming across the globe along with other cascading consequences in the form of glacier melting, sea level rise, submergence of coastal regions, islands, shift in the rainfall pattern and other catastrophic events. The above multifarious interactions among atmospheric compositions, climate change and human, plant and animal health need to be scrutinized and probable solutions to the undesirable changes may be sought.

Climate is the primary determinant of agricultural productivity. Climate change is expected to influence crop and livestock production, hydrologic balances, input supplies and other components of agricultural systems. However, the nature of these biophysical effects and human responses to them are complex and uncertain. For example, crop and livestock yields are directly affected by changes in climatic factors such as temperature and precipitation and the Frequency and severity of extreme events like droughts, floods, and wind storms. Climate change may also force to change the types, frequencies, and intensities of various crop and livestock pests; the availability and timing of irrigation water supplies; and the severity of soil erosion. Agricultural systems are managed ecosystems. Thus, the human response is critical to understanding and estimating the effects of climate change on production and food supply. Agricultural systems are also dynamic; producers and consumers are continuously responding to changes in crop and livestock yields, food prices, input prices, resource availability, and technological change.
Plausible climate change scenarios include higher temperatures, changes in precipitation, and higher atmospheric CO2 concentrations. Although temperature increases can have both positive and negative effects on crop yields, in general, temperature increases have been found to reduce yields and quality of many crops, most importantly cereal and feed grains.

There are many examples of adverse impact of climate change on agriculture not only in under developing countries but also in developing countries like In Argentina, yield of Maize crop decreased in the range of 17-36% and soybean yield decreased in the range of 3-8%. In Brazil yield of Wheat, Maize and Soybean decreased in the range of 15-50%, 2-25%, 6-61% respectively.

1.1. State Profile

Maharashtra is the second largest state of India and is situated in the south west part of India. This chapter tells about the different dimensions of the profile of the state of Maharashtra

1.1.1. Economic Situation in Maharashtra State

The State economy grew by 7.1 per cent during 1999-2000. In 1999-2000 the sectoral growth rates of state Income was 4.7 per cent in Primary Sector (agriculture and allied activities), 7.9 per cent in Secondary Sector (including Industries) and 7.5 per cent in Tertiary Sector. The preliminary estimates of the State Income (i.e. Net State Domestic Product) of Maharashtra at current prices as per (new series 1993-94) for the year 1998- 99 was Rs.2,13,860 crore and the per capita income to be Rs. 23,849. At constant (1993-94)) prices, the State Income in 1998-99 was estimated at Rs. 1,45,420 crore as against Rs.132,342 crore in 1997-98. Thus, the State economy has registered a significant growth of 9.9 per cent in 1998-99 which is more than one and half times of 6.2 per cent growth in 1997-98.

1.1.2. Agricultural Production

The food grains production in the State was around 120.5 lakh tonnes in 1999-2000, less by 5.7 per cent than that in 1998-99. The cotton (Lint) production increased by 8.7 per cent. The oilseeds production decreased by 5 per cent and would be 24.4 lakh tonnes. The sugarcane production is expected to increase significantly by 18.3 per cent and would attain a new peak at 558 lakh tonnes.

1.1.3. Livestock Production

The estimated milk production in the State in 1998-99 was 56.1 lakh tonnes. This was 8 per cent more than the estimated production of 51. 9 lakh tonnes in 1997-98. The estimated eggs production (in number) in 1998-99 was 294 crore showing an increase of 6.21 per cent over the production of 277 crore in 1997-98. The estimated meat production was 203 thousand tonnes in 1998-99 which was more by 2 per cent than the production of 199 thousand tonnes in 1997-98.

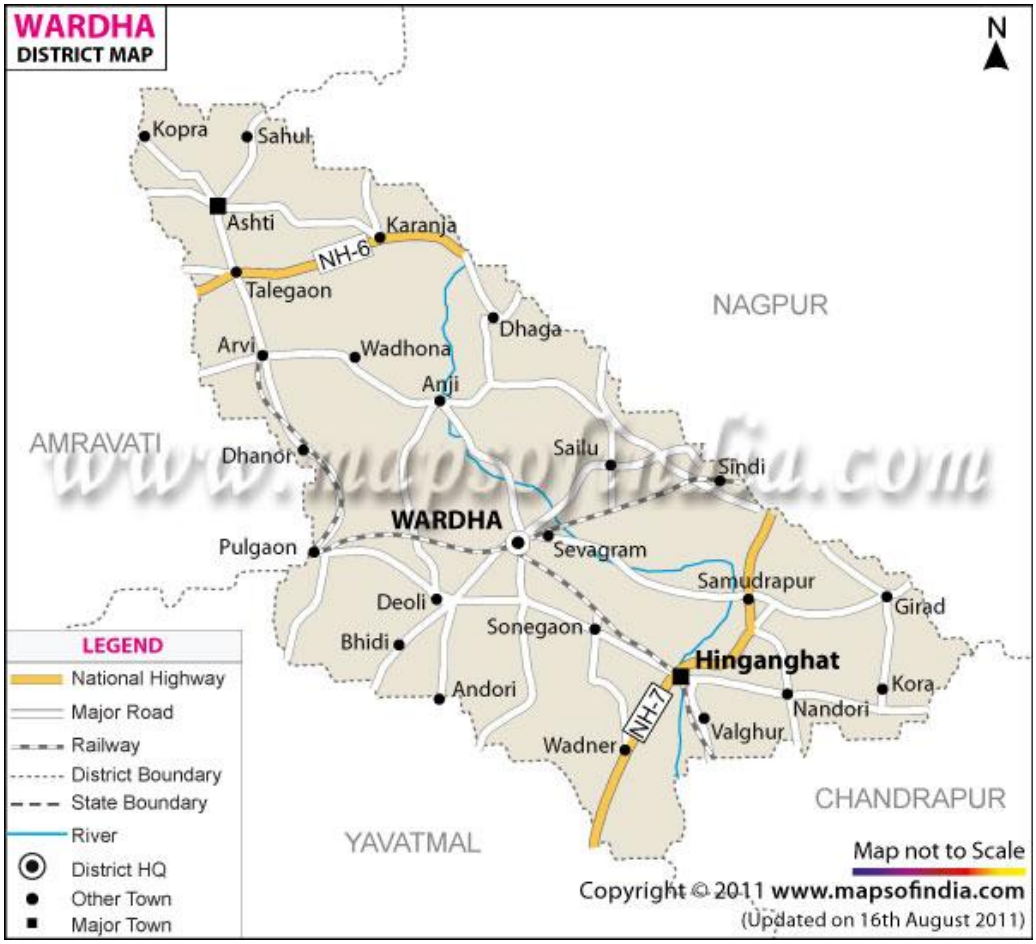
1.2. District Profile

1.2.1. Salient Features of Wardha District

Wardha District is located in the Vidarbha region of Maharashtra state and is named after its most important river, the Wardha. The district is bounded on the west and north by Amravati District, on the south by Yavatmal District, on the southeast by Chandrapur District and on the east by Nagpur District. The boundaries with Amravati and Yavatmal districts are entitled by the river Wardha. The district covers 6,309 sq km and the total population of the district is 1.2 million of which 74 percent, or 9.1lakh, population lives in rural areas according to the Census of 2001.

The percentage of population living in rural areas in Wardha District is far higher than in the state as a whole. Maharashtra being one of the most urbanized states in the country accounts for less than 60 percent of its total population in rural areas by 2001. Thus, Wardha District is more rural compared with the state as a whole.

Map of Wardha District



1.2.2. Rainfall Pattern in Wardha:

The rainfall data over the period 1966-2006 for the district of wardha indicates an assured rainfall pattern with an annual mean rainfall of 1041.1 mm. The analysis of rainfall data for 30 years indicates that only in two years, the annual mean rain fall was below 75 per cent of the annual mean, indicating the occurrence of drought in those two years that is in 1972 and 1998. An analysis of rainy days in Wardha District over the period 1966-2006 indicates fifty-three days as the mean annual rainy days with an average daily rainfall of 19.6 mm, which is equal to Indian mean daily rainfall of 20 mm/ day.

The district receives its rainfall essentially from the south-west monsoon. This monsoon contributes 85 percent of the total annual rainfall. The north-east monsoon accounts for 9 percent while hot weather and cool weather periods account for 4 percent and 2 percent, respectively." An analysis of the quantum of rainfall during the south-west monsoon over the thirty years in Wardha District indicates a mild decreasing trend.

The contribution of rainy days across different seasons to total annual rainy days corresponds to the rainfall pattern and was 82 percent for the south–west monsoon and 3 percent, 6 percent, and 9 percent, respectively, for cool weather, hot weather, and north–east monsoon seasons. An analysis of the number of rainy days corroborates the rainfall pattern, that is, a decrease in the number of rainy days was noticed for the south–west monsoon season.

The analysis of rainfall pattern during the south–west monsoon indicates a mean annual rainfall of 888 mm. considering that the south–west monsoon is the lifeline of agriculture in the district of Wardha, the effective rainfall and run-off during the south–west monsoon has important implications for crop production in the district. The effective rainfall for the south–west monsoon is computed to be around 533 mm and its distribution is 110, 162, 175, and 85 mm, respectively, for the months of June, July, August, and September.8 On integrating the effective rainfall of the district with the water-holding capacity of the soils of the district, which is around 100–150 mm per metre depth, the run-off water is estimated to be 355 mm or 3,550 cubic metre of rain water per hectare per annum. The run off takes away the fertile top soil, leading to severe soil erosion in the district.

1.2.3. Soil erosion:

‘Soil erosion is a surface feature which signifies the loss of soils from the particular area’. Soil erosion adversely affects the fertility status and land use. National Bureau of Soil science and Land-Use Planning has grouped the soils of Wardha into different erosion classes. As per their estimate, soil loss in the district is in the range of 5–20 tonnes per hectare per year in the slight erosion class. The moderate erosion class includes 75 percent of the geographical area of the district and this account for an expected soil loss of 10–15 tonnes per hectare per year, and about 16.5 percent of the area falls under the severe erosion class with an expected soil loss of 15–20 tonnes per hectare per year.

Just about 7.3 percent of the geographical area of Wardha District, which roughly corresponds to the area under non-agricultural use in the district, registers soil erosion within the conventionally permissible limit of 10 tonnes per hectare per annum. This suggests that almost the entire area that is used for agriculture in the district is subjected to a level of soil erosion that is beyond the permissible limit. After accounting for the maximum permissible limit of soil loss of 10 tonnes per hectare per year, the extent of soil loss in the district due to erosion is estimated to be of the order of 19.6 lakh tonnes per annum. Soil erosion results not only in

soil degradation and reduction of soil depth in areas where erosion occurs but also results in silting of water bodies. About 10 percent of the eroded material usually gets deposited in the water reservoirs resulting in silting up of the water bodies and thereby reducing their water storage capacity.

Analysing the soil type in the district, it is found that black soil is the predominant soil type. This is classified into *kanhar (*Heavy soils), *madhyam* (Medium soils), and *bardi* (Light soils).9 In the district as a whole, the extent of *kanhar* is 35.4 percent; *madhyam,* 43 percent; and *bardi,* 20.6 percent. *Kanhar* soils are very deep and have slow permeability, which facilitates good crop growth. However, these soils are in the low–medium category of organic carbon content, indicating low level of availability of macronutrients such as nitrogen. *Kanhar* soils are also alkaline in nature, implying that many of the micronutrients like aluminium, copper, cobalt, manganese, and zinc becomes less available to plants.

In addition to this, *kanhar* soils are high in calcium and magnesium carbonate which have adverse implications for crop growth. Phosphorous reacts with calcium and magnesium carbonate and gets fixed as calcium phosphate and magnesium phosphates which are highly immobile phosphorous compounds. This results in unavailability of phosphorous, a major macronutrient to the plants. However, the cation-exchange capacity (CEC) of these soils is high which makes them more responsive to fertiliser application and nutrient management. That is, to overcome the inherent deficiencies of *kanhar* soils it is possible to employ appropriate corrective measures.

Table no. 01 *Change in Land-use Pattern in Wardha District, 1961–62 to 2004–05:*

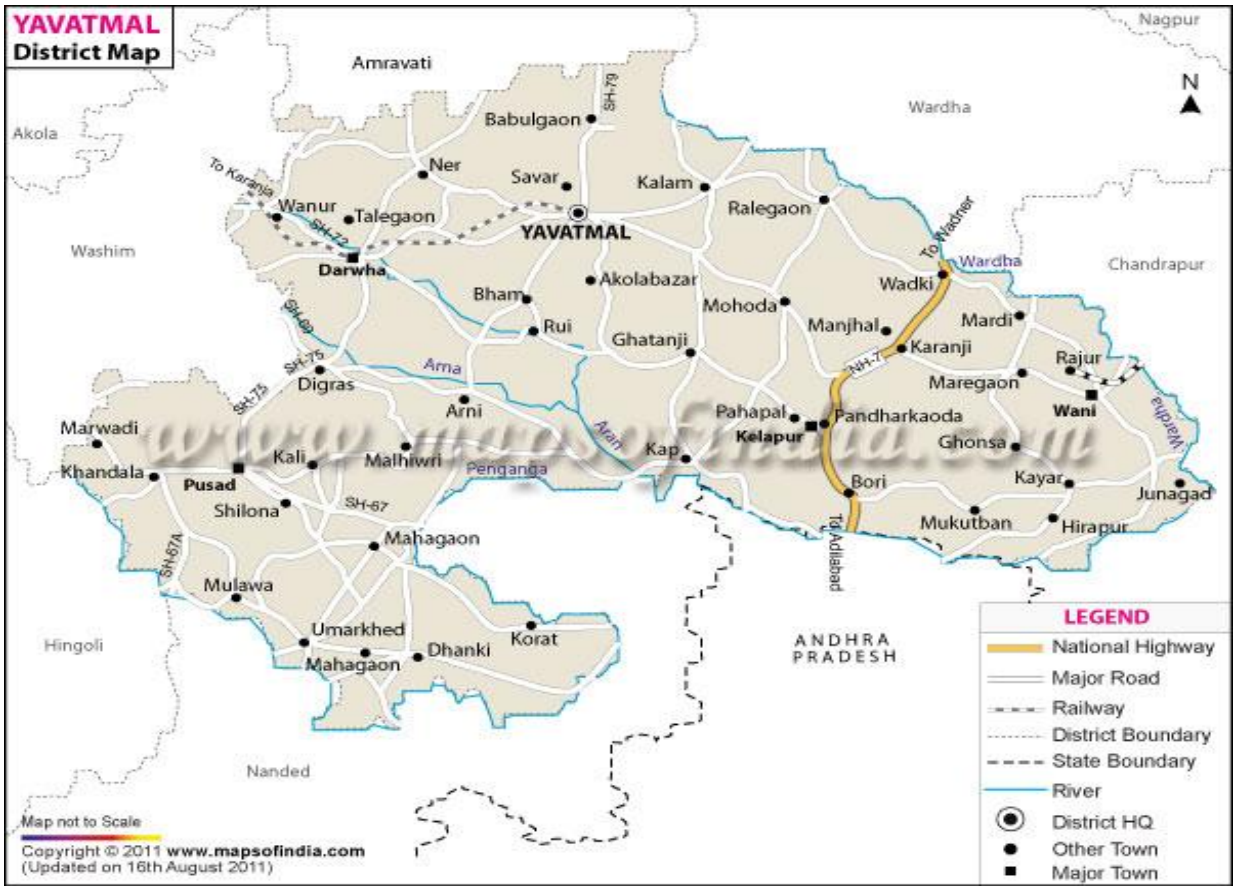
Three years average centred around the year	Net sown area		Current fallows		Other fallows		Culturable west land		Barren unculturable land		Permanent pasture		Forest area	
	In '00 ha	%	In '00 ha	%	In '00 ha	%	In '00 ha	%	In '00 ha	%	In '00 ha	%	In '00 ha	%
1961-62	4024.00	63.91	87.73	1.39	132.40	2.10	274.40	4.36	74.00	1.18	519.33	8.25	648.80	10.30
1971-72	4262.00	67.61	67.33	1.07	74.00	1.17	182.33	2.89	68.33	1.08	510.33	8.10	669.33	10.62
1981-82	4171.33	66.12	121.33	1.92	174.33	2.76	142.00	2.25	68.00	1.08	463.00	7.34	671.00	10.64
1991-92	3855.33	61.11	201.33	3.19	246.00	3.90	203.00	3.22	186.00	2.95	459.33	7.28	758.00	12.01
2001-02	3655.00	57.93	624.33	9.90	232.67	3.69	148.33	2.35	107.00	1.70	388.00	6.15	620.33	9.83
2004-05	3650.33	57.86	630.33	9.99	220.00	3.49	155.00	2.46	105.33	1.67	382.00	6.05	624.67	9.90

1.2.4. Salient Features of Yavatmal District:

Yavatmal district is a district of the Indian state of Maharashtra. It is located in the region of Vidarbha, in the east-central part of the state. Yavatmal district is bounded on the north by Amravati District, to the northeast by Wardha District, to the east by Chandrapur District, to the south by Andhra Pradesh state and Nanded District, to the southwest by Hingoli district, and to the west by Washim District.

Cotton and wheat are the predominant crops grown in the district. The chief rivers flowing through the district are the Wardha and the Penganga. The Wardha is the only river flowing through the district which is partly navigable. The Bembla and the Nirguda are the main perennial tributaries of the Wardha which flow through the district. Adan is other important river in this area.

Map of Yavatmal District



*talukas namely Arni, Umarkhed, Kalamb, Pandharkawada(Kelapur), Ghatanji, Zari Jamani, Darwha, Digras, Ner, Pusad, Babhulgaon, Mahagaon, Maregaon, Yavatmal, Ralegaon and Wani, Akola Bazar being another important town in the district.

1.2.5. Rainfall Pattern

The average rainfall of Yavatmal District is 911.34 mms. In Rabi cultivation is said to have decreased partly because of the uncertainty of the rainfall in recent years. On the other hand it is said that a heavy rainfall would injure or even ruin cultivation in some parts of the District and that some villages in Pusad taluka formerly went out of cultivation from this cause. The rainfall of the last 12 years has certainly been enough when it has come at favourable times. The 25 years average gives 6 inches in June, 12 in July, 8 in August, 7 in September, 2 in October and less than 1 in each of the other months. There is no observatory in the District. Yavatmal us higher and cooler than Amravati or Akola, but isn't as cool as Buldhana. There is generally a breeze in the hot weather, so that the nights are cool. The District has rather a bad name for fever.

1.2.6. Climate

The climate of the district is in, general hot and dry with moderately cold winters. The year may be divided into four seasons. The hot season begins in March and extends up to the first week of June. This is followed by the south west monsoon season which last up till the end of September, October and November constitute the post monsoon season and is followed by the cold season which last up till February.

Most of the total annual rainfall is reserved during the south west monsoon season. The rainfall is not uniform in all parts of the district. Wani in the eastern part of the district receives 1,125 mm of rain and Darwha in the western, part of the district receives 889 mm of rain Yavatmal in the central portion of the district receives 1099.5 mm of rain. In general, the amount of rainfall increase as one proceeds from west to east.

The summer season from March to May is one of continuous rise in both day and night temperature. May is generally the hottest month of the year with the mean daily maximum temperature at about 42 C with the onset of the south west monsoons there is an appreciable fall in temperatures and the weather becomes pleasant. With the withdrawal of the monsoon day temperature increase slightly while night temperatures progressively decrease. From about the end of November both day and night temperature fall rapidly and December is usually the coldest month of the year with the mean daily minimum temperature at about 13 C. The cold waves over northern India sometimes affect the district and the minimum temperature may drop to about 5 C.

During the South-west monsoon season the air is humid and the skies are heavily clouded to overcast. During the rest of the year the air is generally dry and the skies are clear or lightly clouded. Winds are generally light to moderate with some increase in force in the latter part of the summer season and the monsoon months.

1.2.7. Agriculture Crops

Kharif Crops

Jowar, Cotton, Groundnut and rice are the major Kharif crops.

- Jowar – It grows in various talukas such as Pusad, Ner, Mahagaon, Umarkhed, Maregaon, Ghatanji.
- Cotton – Cotton growing major talukas are Ghatanji, Wani, Pusad, Umarkhed, Mahagaon and Ner.
- Groundnut - Groundnut crop largely taken in talukas such as Pusad, Digras, Darwha, Arni, Ghatanji.

Rabi Crops

Wheat and gram are the important crops grown in Rabi sesame and linseed (Jawas) are Rabi crops.

- Wheat – Mainly Wheat grown in the talukas lying in river basins of Wardha and Painganga. Umarkhed, Pusad, Wani, Digras, Maregaon and Zari Jamni are major wheat growing talukas. Other talukas such as Arni, Ghatanji and Yavatmal also takes this crops.
- Gram – Gram is grown in the talukas such as Umarkhed, Wani, Ralegaon, Maregaon, Pusad, Digras, Ghatanji and Babhulgaon.

Irrigated crops

Sugarcane, bananas, Oranges, Grapes and betel leaves are few important irrigated crops grown in district.

- Sugar cane – Sugarcane is grown in the Pusad, Umarkhed and Mahagaon talukas.
- Bananas and Oranges – Zadgaon, Ralegaon, Kalamb and Dabha-Pahur regions have various Banana and Oranges plantations.
- Grapes – There are vineyards in Pusad and Umarkhed region.
- Betel leaves - Lalkhed, Darwha, Digras and Umarkhed region have betal leaves plantation.

Chapter 2

Why study farmer's perception on climate change

Farmer's perception is very important in this critical issue of climate change. There are a lot of consequences of climate change and there are a lot of things talked about climate change. But the ultimate adverse effect will be on agricultural production and farmer's livelihood.

It is more important in case of country like India, where agriculture is back bone of country and suicide prone belt of Maharashtra state (Vidarbha region), where high input cost is already a big problem for debt and climate change consequences will also affect adversely. And most vulnerable to climate change are cultivators and marginal farmers.

Farmer's perception tells us what practical problems a farmer is facing, and we cannot understand the challenges faced by farmers just by sitting in four walls.

Farmers' perception on climate change gives a useful perspective on challenges facing farming practices and is of immense value in generating ideas to think and plan adaptations to cope with adverse climate changes. Vulnerable group of farmers are unaware of the challenges in future and they don't know what the scientific ways to cope up with these things are. To cope up with climate change adverse effect a farmer has to develop alternative methods of farming for example, farmers in Alwar district of Rajasthan are cultivating vegetables by digging in small area and covering it with cloth to resist high temperature of climate.

This study is also a part of effort made by us to promote this kind of study in other parts of country; it will help to understand problems of farmer (especially vulnerable farmers) and to adapt to farming practices that can sustain agriculture in climate change conditions.

Chapter 3

Rationale

In this study, we were mainly focusing impact of climate change on agriculture through which our objective was to know, what the different reasons are for decline in agriculture productivity. And what are the impacts of climate change on agriculture livestock, health status and natural resources. This study can be used for improvement of agriculture technique, productivity, soil fertility and also can help in understanding health problems faced by farmers.

Chapter 4

Review of Literature

We had gone through the project paper of Sunanda Shudhakar, S.P.Singh and D.k. Nauriyal; Indian Institute of Technology, which was based on sustainable agriculture and climate change. This paper was published in Journal “sustainable development and environmental protection”. This paper explains that, Climate is changing naturally on its pace. This rapidly changing phenomenon may culminate in adverse impact on human health and biosphere on which we depend. Agriculture sector is one of the sensitive areas which would be influenced by the projected global warming and associated climate change.

This paper tried to examine the adverse impacts of climate change on the agriculture system and how it is contributing to crop losses. As agriculture represents the core part of the Indian economy and provides food and livelihood activities to a bulk of the population. This paper also endeavours to find out the ongoing and emerging threats on agriculture. Sustainable agriculture wholly dependent on fertile arable land safe water disastrously degraded waste and misused. Arable land and unpolluted water are fast becoming the main determinant of future sustainable agriculture. Climate change is supposed to exert a crucial and negative effect on the mechanism of monsoon which is the crux of Indian rainfall and precipitation. This paper had given basic idea about climate change and its impact on agriculture which was more helpful for our study.

Chapter 5

Objective

The broad objective was to study the impact of climate change on agriculture in Vidarbha region. However the specific objectives of the research were:

1. To Study the profile of the respondents.
2. To find out the perception of farmers on impact of climate on health and livestock.
3. To observe the perception of the farmers on the impact of climate change on natural resource.
4. To Study the perception of the farmers on the impact of climate change on crop production.

Chapter 6

Sources Consulted during Study

6.1. Sampling

It is already mentioned that primary focus of the study was to understand the farmer's perception pertaining to impact of changing climate on agriculture in Vidarbha region of Maharashtra. The sampling for this study was a multi stage sampling. At the first the Vidarbha region is selected purposively because it is known for farmer suicide cases in last 10 years and one of the main reasons behind this was loss in agriculture. We as interns were placed in the organization CSA. This organization is working in the Yavatmal and Wardha districts of this region. Therefore, both the districts were selected purposively in the second stage. Similarly at the third stage the blocks were selected purposively as the organization was found working in the four blocks in the below mentioned Table. In the fourth stage the villages were selected looking towards the distance from the block headquarters and unavailability of irrigation facility. In this manner the interns had selected 13 villages from Yavatmal district and 10 villages from Wardha district purposively. In the last stage the farmers were selected purposively according to their availability in the village. However, it was decided by CSA that the interns must interview at least nine farmers in a village. In total 202 farmers were interviewed for this study. Amongst them 198 were interviewed through FGD and individual interview whereas four were involved in PRA techniques.

6.2. Tools and Techniques of Data Collection-

Both primary and secondary data were collected for the study. Information related to the state profiles and district profiles were collected from CSA, Wardha and Agriculture department of wardha and Yavatmal districts as well as Internet. The primary data was collected with the help of semi structured questionnaire (See Annexure), whereas the FGDs and PRA techniques were conducted with help of check list.

(Annexure).It is worth mentioning that both the quantitative as well as qualitative data were collected for this study.

Table no.02 Name of Villages and frequency of farmers interviewed:

District	Block	Name of village	Frequency
Yavatmal	Kalamb	Aloda	9
		Bharampur	9
		Donoda	9
		Ghoti	9
		Husnapur	9
		Manjarwaghad	9
		Khudantpur	4(PRA)
	Babhulgaon	Astharampur	9
		Mubarakpur	9
		Saujana	9
		Savangi	9
		Varudh	9
		Yerangao	9
Wardha	Wardha	Bori	9
		Dhuela	9
		Kavtha	9
		Narshula	9
		Peth	9
		Amboda	9
	Seloo	Gondapur	9
		Kanhapur	9
		Kherda	9
		Kshirsamudra	9
Total			202


Research Design:

The study aims to measure the impact of climate change on agriculture and farmers perception on it.

- Strategy: The overall strategy of research adopted in this study was survey, FGD and PRA.
- Population: All the people of Wardha and Yavatmal district.
- Sample: Two hundred two villagers were surveyed in this study.
- Sampling Unit: Nine farmers from each village were selected randomly.
- Sampling Method: Villages and Households were randomly selected. So the convenient type of sampling was used.


Chapter 7

Study, Results and Discussion

7.1. Profile Characteristics of Respondent

Table no.03

Category	Percentage	Frequency
Number of Household		
1 to 4 (Small Family)	52	105
5 to 8 (Medium Family)	47	94
9 and above (Large Family)	1	3
Age group (Years)		
22-35 (Young)	19	38
36-50 (Middle)	48	97
51-70 (Middle-old)	31	62
Above 70(old)	2	5
Farming experience		
0-5 years	1	2
5-10 years	8	16
10-20 years	31	62
20-30 years	33	66
>30 years	27	56
Land holding(in acre)		
1 to 2.5(Marginal)	8	17
2.5 to 5(Small)	47	96
6 to 10(Medium)	27	54
11+(Large)	18	35
Fodder production		
Yes	39	79
No	61	129
Land location		
Hill top	1	2
Hill side	1	1
Valley	30	60

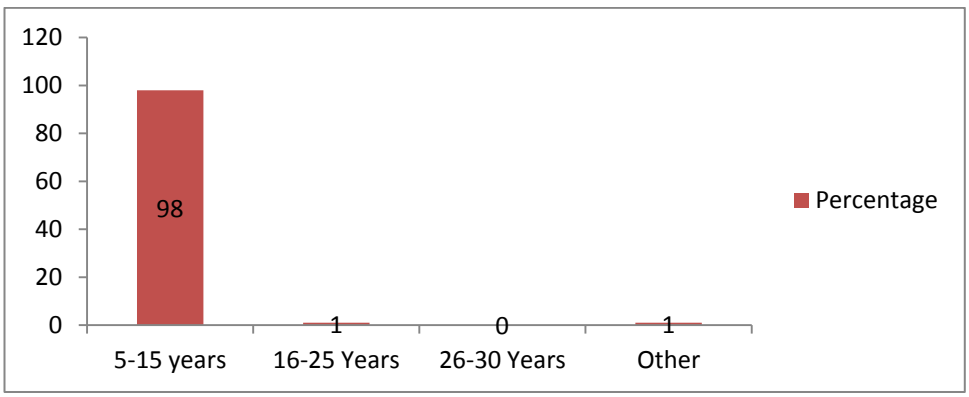
Swamp Plain Other	3 62 3	7 126 6
Fertility of soil Very high High Medium Low	 1 25 53 21	 3 50 107 42

Data was collected to know about the socio economic profile of the respondent and the results were same presented in Table three. It was observed from the analysis that Majority (51.98%) of the respondents were belonging to Small family size followed by medium (46.98%) and a meagre (1.48%) were belonging to large family type. It could be due to the nuclear family type. And table also interprets that 48 percent of the respondent were from the age group 36 to 50 years, 31 percent of them were found in the age group 51 to 70 years.

Out of 202 respondents, 63.36 percent farmers were having experience of around 10-30 years and only 7.92 percent farmers were having experience of around 10 years. It indicates that majority of them have been in farming for long time. Additionally it was emerged out that 47 percent farmers were small farmers, nearly one fourth (27 percent) were medium farmer and 18 percent were large farmers.

And interestingly only 39 percent farmers found engaged in fodder production. Majority of the respondent (62 percent) mentioned that their agriculture land was situated in plain area, another 30 percent mentioned valley for the same. Fifty three percent respondents described their soil fertility as medium, whereas 25 percent and 21 percent mentioned the same as high and low respectively.

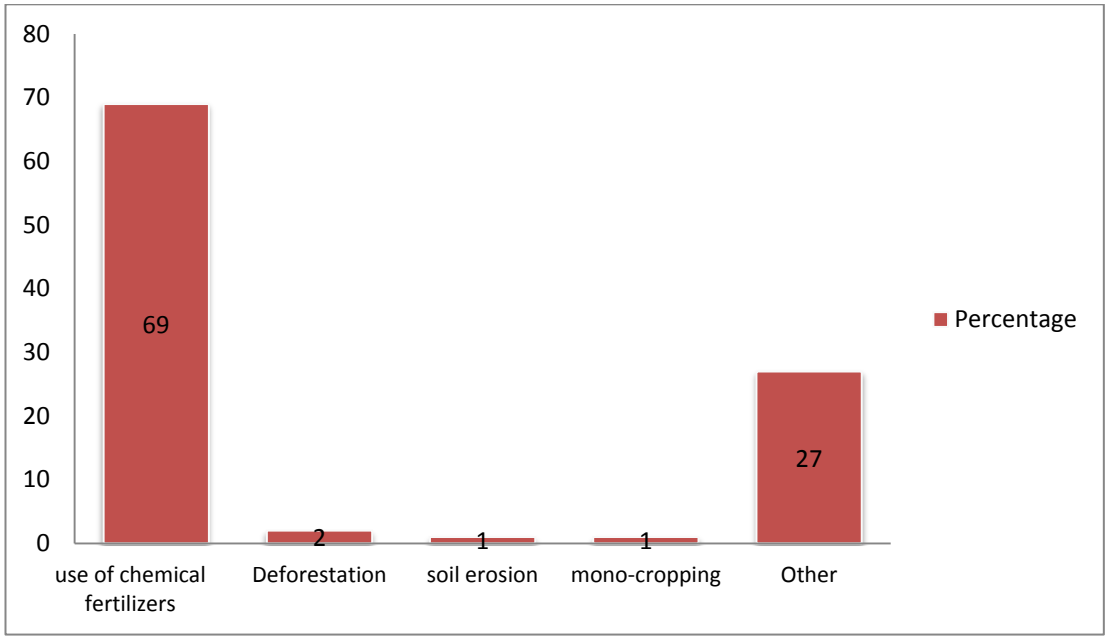
Graph no.01- Change in the fertility of soil in past years:



It was interesting to know that majority (98 percent) farmers reported that soil fertility of their land was changing since last 5-15 years. It was also found that they haven't got any soil testing report even though soil testing samples were sent to respective authorities.

In these 98 percent farmers, there were mixed (both positive and negative) responses, some farmers reported that their land is getting harder, there are changes in colour of soil, there are sudden decreases in crop production (don't know the reason behind it) and positively farmers reported that there are no changes in soil fertility only in last 5 to 15 years their land productivity has increased by cropping Bt cotton.

Graph no.02- Main reason behind incline/decline in soil fertility of farmers land:



Majority (69 percent) of the farmers believe that the main reason behind incline/decline in soil fertility is use of chemical fertilizers and 29% farmers believe that there may be some other reasons like use of less use of cow dung, Bt cotton, environment, erratic rainfall pattern, barren land, calcinated land, soil erosion, environment and some farmers don't know what is the reason behind incline/decline in soil fertility.

Some farmers have calcinated soil that's why their land is unproductive; in their land crop production is irrespective of how much fertilizer was used.

Use of chemical fertilizers is increasing day by day because farmers believe that it increases crop production (the more you invest, the more you'll get) and other reason, there is competition between farmers that who uses more fertilizers.

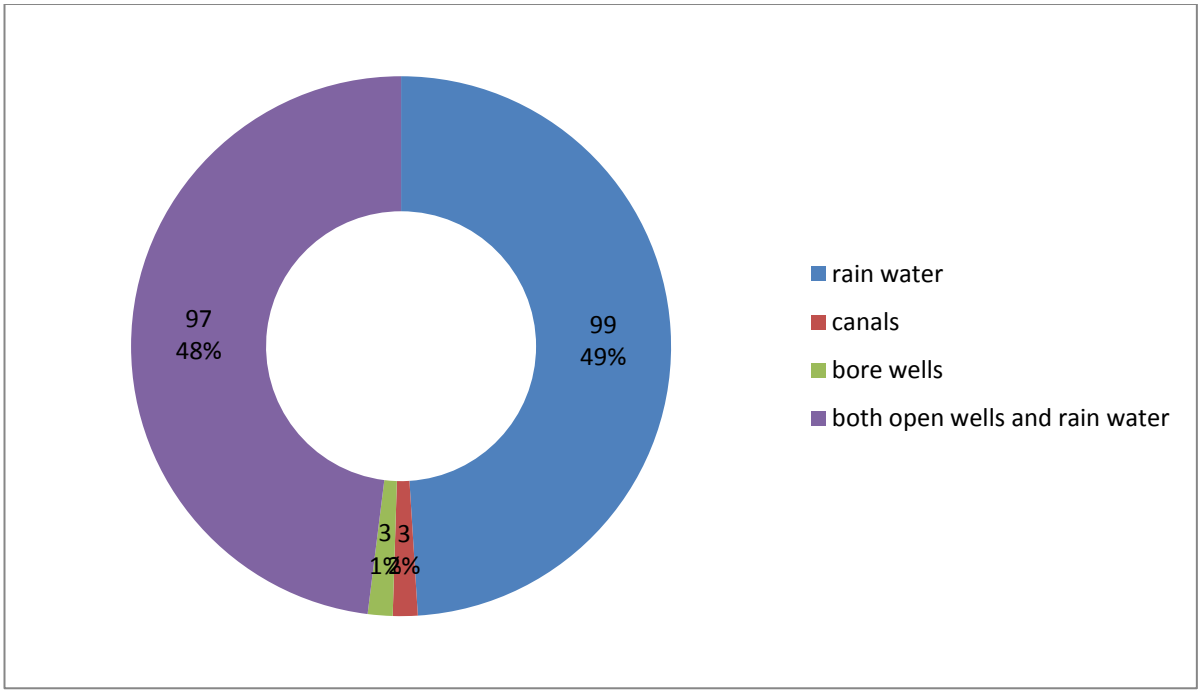
7.2. Water Resources:

Table no.03- Water availability in farmer's region:

Water availability	Percentage	Frequency
high availability	16	32
Medium	65	132
low	19	38

The data from table depicts that 65 percent farmers reported that water availability in their land was medium and 16 percent reported that they had high availability of water and 19 percent reported that they had not enough water for irrigation.

Graph no.04- Source of water for agriculture:



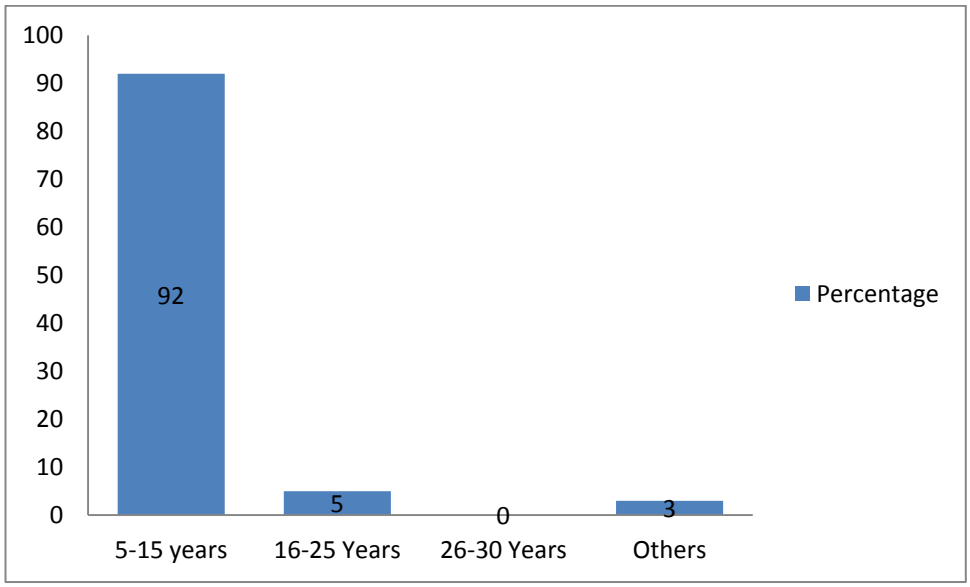
The graph clearly indicates that 49 percent farmers were dependent only upon rain water for agriculture and 48 percent were dependent upon both well and rain water. Along with rain water some others were dependent upon canals and bore wells also.

It clearly indicates that if low rainfall or drought condition prevails then it can affect livelihood of farmers.

Some farmers have irrigation facilities (river or canal) available at some distance but don't have access to that water because of unavailability of money for purchasing motor pump.

One good thing that we observed some farmers were also getting water for irrigation from nearby farmers' well and in return they give money, wheat, gram or other things. But unfortunately this happens in case of same status of both farmers otherwise farmer don't get any kind of help even if the marginal/ small farmer is offering money for water.

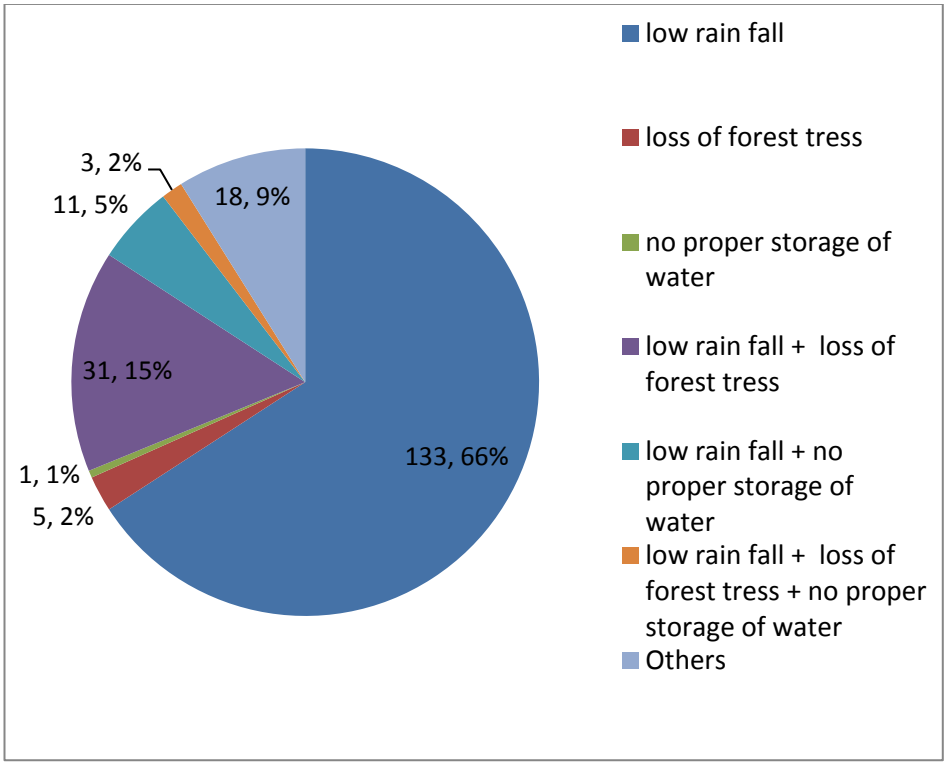
Graph no.04- Shortage of water for crop and livestock in past years:



According to farmer's perception, the graph clearly illustrated that 92 percent farmers were short of water for agriculture and livestock in last 5-15 years. And other 8 percent reported that they were short of water in last 16-25 years and 26-30 years or other. Farmers also reported that this shortage was just for only one or two years.

The water level in Wardha and Yavatmal districts was decreasing for last ten years. According to farmers, In Dhuela village (Wardha) in last three years water level decreased from 30 feet to 50 feet. In Khudantpur village (Yavatmal) water level decreased from 15 feet to 30 feet in last 10 years respectively.

Graph no.05- Reason behind the shortage of rain water:



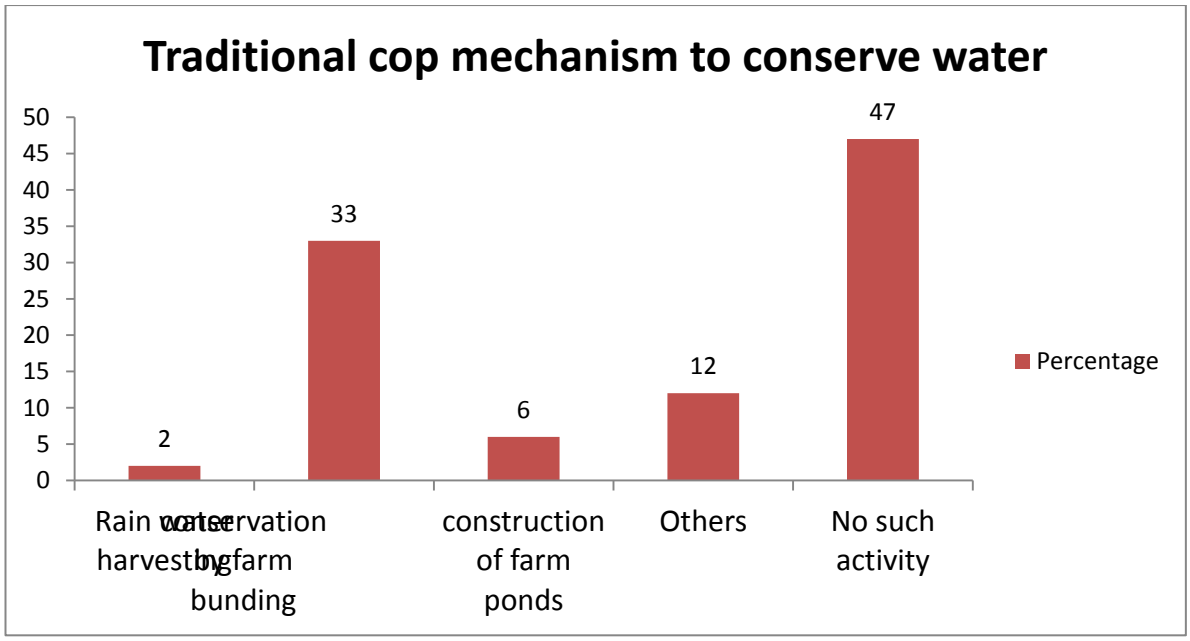
Majority (66 percent) of the farmers revealed that low/deficit rain fall was reason behind shortage of water, 15 percent reported low rainfall and loss of forest trees and others mentioned that low rainfall, loss of forest trees and no proper storage of water.

Table no.05- Reason for less water availability for agriculture:

Reason	Percentage	Frequency
No canals	28	56
Bore wells not Working	3	6
Low rains	19	39
No canals + Bore wells not Working	1	2
No canals + Low rains	5	11

Low rains+ others	9	19
No canals+ others	7	15
Other	27	54
Total		202

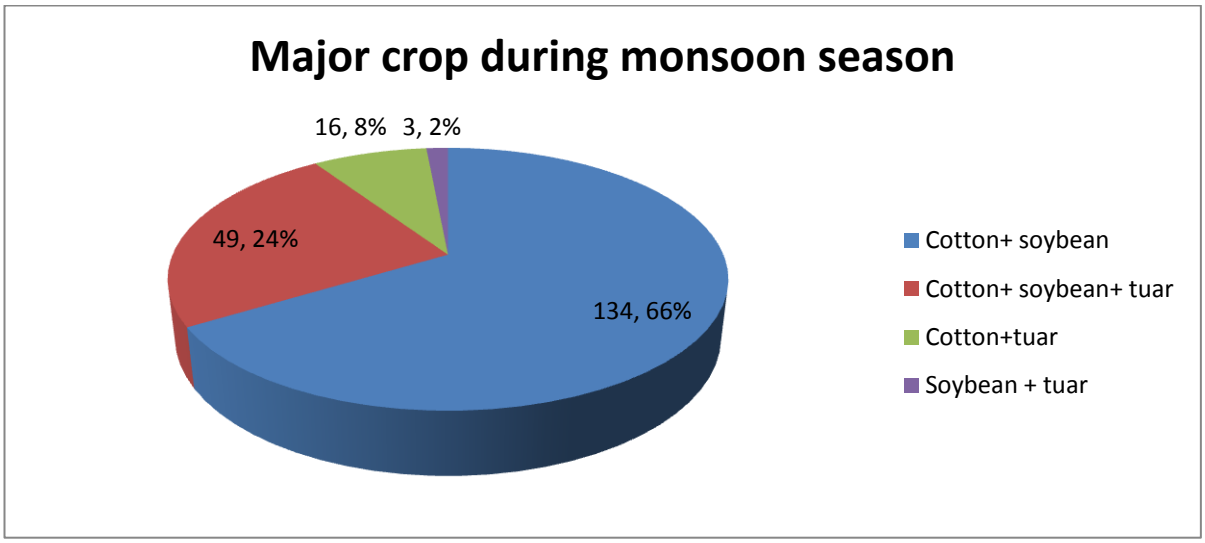
Graph no.06- Harvesting methods:



It can be analyzed from above graph that 33 percent farmers were involved in farm bunding and only 2 percent farmers were doing rain water harvesting and six percent were using farm ponds and 12 percent were using different cop mechanisms to conserve water like sprinkler, tanks. More interestingly 47 percent farmers were not using any traditional cop mechanism to conserve rain water. There was a government scheme for doing farm bunding; it was a good scheme but still nearly 50 percent farmers don't practice such things, so it was a little worry factor. Farmers also wanted a subsidy scheme on this. In Yavatmal district there were no such practices available, if these schemes would be made available in this region, crop production will increase and farmers will produce new crops also.

7.3. CROPPING PATTERN

Graph no.07- Major crop during monsoon season:



Majority of them cultivated cotton and soybean (66 percent) followed by 24 percent cultivating cotton, soybean and tuar and other farmer's major monsoon crop was cotton-tuar and soybean-tuar.

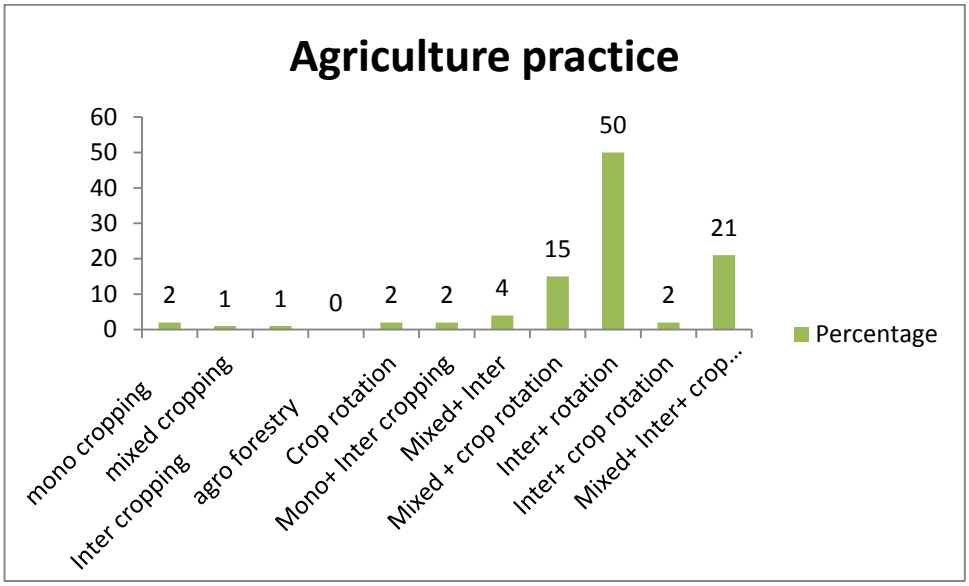
Graph no.08- Major crop during winter season:

Name of Crop	Percentage	Frequency
Wheat	32	65
Gram	24	48
Sorghum	4	8
Wheat + Gram	6	13
Wheat + Gram+ Sorghum	1	2
Vegetables	2	5
Gram+ vegetables	1	1
Wheat + Gram+ vege	2	5
Wheat + Gram+ Sorghum+ Vegetables	1	2
Others	8	16

No winter crop	19	37

Table interprets that 32 percent farmers reported that they cropped wheat and 24 percent cropped gram, 4 percent sorghum and 3 percent cropped only vegetables and some other cropped all other mixed form of crops. More interestingly 18 percent farmers had no crops in winter season.

Graph no.9- Form of Agriculture Practice



According to farmers' perception majority of farmers were using mixed cropping and crop rotation (51 percent) followed by mixed-inter cropping and crop rotation (21 percent) and 15 percent farmers were using mixed cropping and crop rotation. Some other form of agriculture practices are depicted in above graph.

Table no 06- Use of seed in agriculture

Name of Crop	Percentage	Frequency
seeds from agriculture institutes	0	0
seeds from the market	47	94
seeds conserved at home	0	0

seeds from agriculture institutes+ conserved at home	0	0
seeds from the market + conserved at home	53	108
Other	0	0
Total		202

It can be observed from above table that 53 percent farmers were using seeds from market as well as seed conserved at home and 47 percent seed only from market. Seeds of red gram and soybean were used by farmers from their own. Some farmers were given expired seeds; seeds didn't germinate that lead to less crop production and this can also lead to debt condition.

Table no7- Source of synthetic and organic fertilizers:

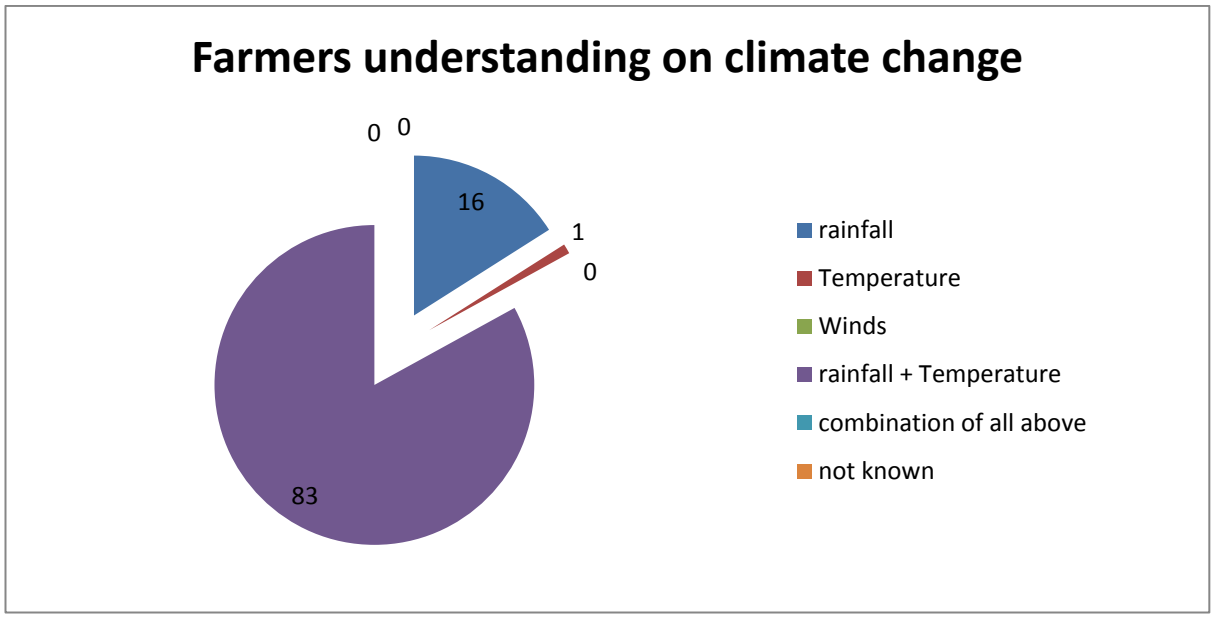
Source of fertilizers	Percentage	Frequency
from agriculture research institute	0	0
Market	3	6
use of cow dung	0	0
green manuring(daincha)	0	0
Other	0	0
Market+ use of cow dung	78	157
Market+ use of cow dung+others	19	38
Total		202

It can be observed from above table that 78 percent farmers were using market fertilizers and cow dung, 19 percent were also using some other sources of fertilizers like compost and biomass along with market fertilizers and cow dung and only three percent were using only market fertilizer.

Farmers who had no livestock and enough sources to purchase cow dung so for the same they request gadia lohars (Nomadic community) to stay in their land that is how they get cow dung as a fertilizers.

7.4. Climate Change Awareness:

Graph no.10- Farmers understanding on climate change:



Data was also analyzed to know the perception of the farmers with regard to changing climate and the results of the same suggest that a majority (83 percent) of the respondents mentioned about change in temperature and rainfall both, 83 percent farmers reported that there was change in both rainfall and temperature, 16 percent farmers reported that there was change in rainfall only and 1percent farmers reported that there was change only in temperature.

Table no 8- Changes in the climate for the last 20 years:

Farmers Observation	Percentage	Frequency
changes in the rainfall pattern	30	60
changes in the temperature	2	3
sudden extreme	.50	1

events		
changes in seasons	.50	1
changes in the rainfall pattern + temperature	62	126
changes in the rainfall pattern + temperature + seasons	4	9
Others	1	2

Majority of farmers (62 percent) reported that there was change in both rainfall pattern and temperature, 30 percent farmers reported changes in the rainfall pattern.

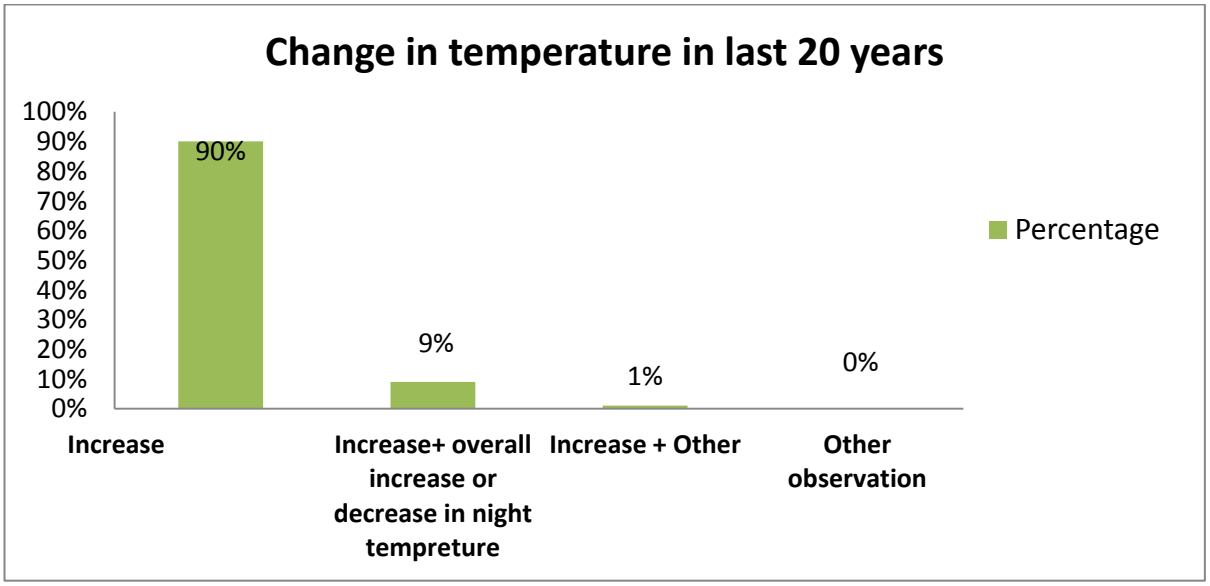
Graph no.11 Farmers' understanding on rainfall pattern:

Farmers Observation	Frequency	Percentage
increase in rainfall	3	1
decrease in rainfall	98	49
changes in the rainfall intensity	1	1
untimely rainfall	23	11
delayed monsoon	0	0
Others	17	8
increase in rainfall+ untimely rainfall	5	2
increase in rainfall+ untimely rainfall + delayed	1	1

monsoon		
decrease in rainfall + untimely rainfall	26	13
decrease in rainfall + untimely rainfall + delayed monsoon	27	13
decrease in rainfall + untimely rainfall + Others	1	1

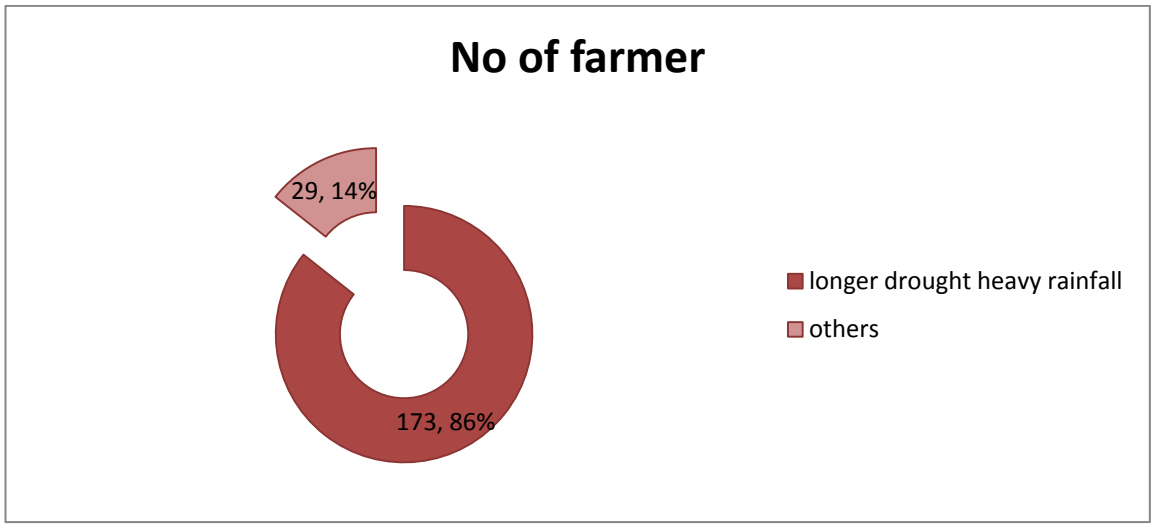
Majority of farmers (49 percent observed only decrease in rainfall, 13 percent farmers observed decrease in rainfall, untimely rainfall and delayed monsoon and other 13 percent farmers observed both decrease in rainfall and untimely rainfall.

Graph no.12-Changes in the temperature in the last 20 years:



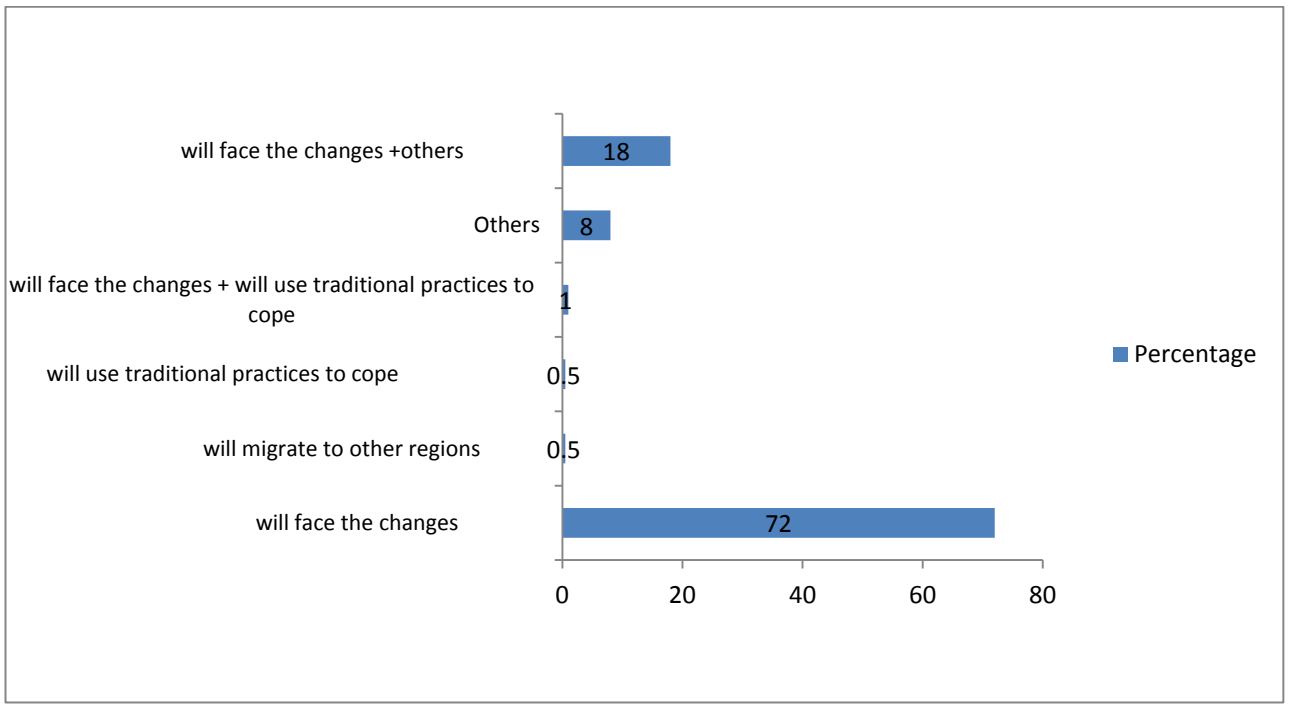
It can be interpreted from above graph that a vast majority of farmers (90 percent) reported increase in temperature followed by observers of both increase in temperature and overall increase or decrease in night temperature (9 percent) and other (2 percent) had some other observations.

Graph no.13- Farmer's experience on extreme event in the last five years:



According to the farmers' perception a cursory look at the graph indicates that 86 percent farmers reported extreme events like longer drought and heavy rainfall during last five years. And other 14 percent had observations like dew (fog), high wind speed or no observation as well.

Graph no.14- What a farmer will do if extreme weather events appear more frequently:



The graph interprets that 72 percent farmers reported that they will face the changes if extreme weather events will appear more frequently in future but they also said they don't know what they will do? Rest of the farmers also gave same kind of answers.

Table no.09-Major impacts of changes in weather conditions:

Impact	Frequency	Percentage
impact on agriculture	113	56
impact on water	2	1
impact on livelihood	2	1
impact in livestock	3	1
impact on human health	1	1
impact on agriculture+ water	6	3
impact on agriculture+ livestock	18	9
impact on agriculture+ human health	15	7
Other	43	21

Table clearly reveals that slightly more than half of the farmers (55.94%) opinion was that change in weather condition impacted agriculture. Nearly one tenth farmers (8.91%) opinion is that it has impacted agriculture as well as livestock. 7.42% farmers believe that both agriculture and human health are impacted by changes in weather condition.

And 21.28% farmers gave mixed responses of above mentioned impacts and some farmers also had no such kind of observations.

Farmers also observed that Non hybrid cow's milk production is decreasing and milk's smell and taste changed from last few years. This may be due to consumption of chemical treated fodder.

Table no.10-Changes in the average crop yields in the past 20 years:

average crop yields	Frequency	Percentage
increase in crop yields	50	25
decrease in the crop yields	41	20
increase in the pest attack	16	8
increase in crop diseases	2	1
increase in crop yields + decrease in the crop yields	4	2
increase in crop yields + increase in the pest attack	55	27
decrease in the crop yields+ increase in the pest attack	19	
Others	15	7

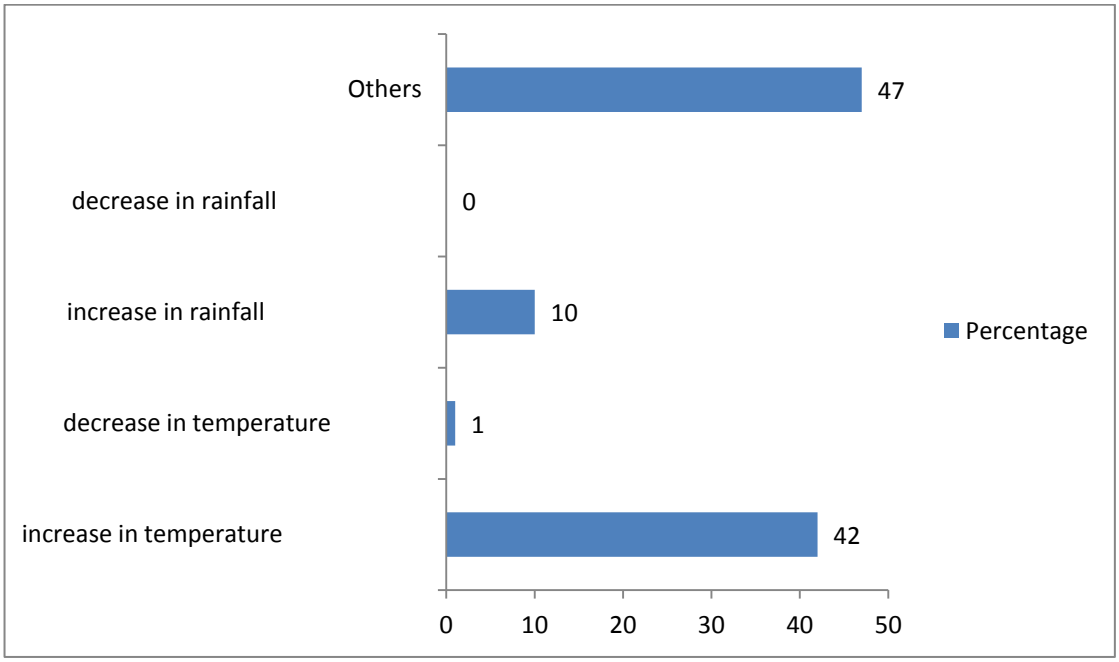
Regarding changes observed in the average crop yields during past 20 years the graph depicts that 25 percent farmers observed increase in crop yield (may be reason of Bt cotton high production) and 20 percent famers observed decrease in crop yield.

Table no11-Incidence of crops pests and diseases on farm in the last 20 years:

incidence of crops pests and diseases	Percentage	Frequency
very severe	40	81
Severe	50	100
mild	10	21
no incidence	0	0

It can be drawn from the above table that incidence of crop pests and diseases were severe (50 percent), very severe (40 percent) and mild (10percent) on farmer's land. Pests like Churada, Murada (Sucking pests), Army worm, White Fly, Bollworm, Untalli, American bollworm and pest diseases like Redding of leaves, Scorching of leaves and Wilting were severely affecting crop yield.

Graph no.15-Reason behind the increase in pest or disease



A desultory look at graph indicates that 42 percent farmers reported that reason for increase in pest was temperature and 47 percent farmers reported that some other reasons like humidity, cloudy environment, Bt cotton, chemical fertilizers and pesticides and research varieties were reasons behind pest attack and diseases.

Table no12- Adaptive measure to crop pest/disease that was already being practiced:

increase in pest or diseases	Percentage	Frequency
using bio pesticide	64	127
using traditional methods	15	33
not such practices	15	30
Others	6	12

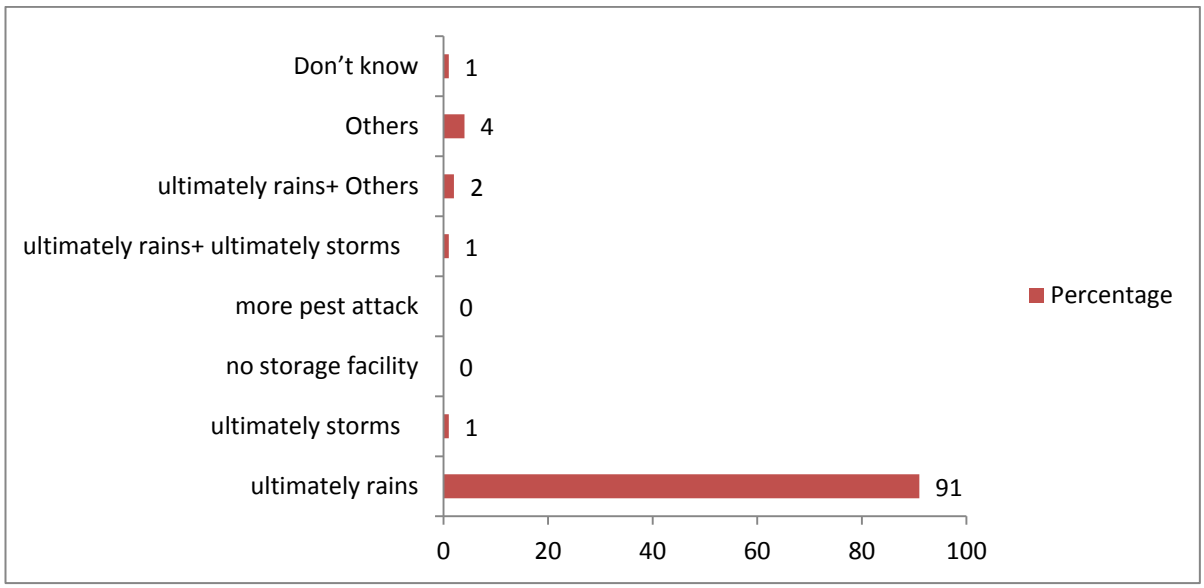
Majority of farmers (63 percent) were using bio pesticides, and 15 percent were using traditional methods and 15 percent were not using such adaptive practices to crop pests/diseases.

Table no13-Type of storage facility to store crops after harvesting:

storage facility	Percentage	Frequency
in the house	100	202
in the open	0	0
Granary	0	0
no storage facility	0	0

Interestingly 100% farmers were storing harvested crops in their houses.

Graph no.16- Reason for post harvest crop losses in the last years:



According to the farmers perception from above graph we can easily interpret that 91% farmers say that the reason of post harvesting is ultimately rains and others say the reason may be more pest attack, no storage facility, storms.

Table no14-Impact of the changing weather on live stock rearing:

Impact	Percentage	Frequency
shortage of fodder	74	149
shortage of pasture	11	21

land		
shortage of water	0	0
shortage of fodder+ pasture land	3	7
shortage of pasture land + water	1	1
No impact of weather	3	7
any other	8	17

According to farmers' perception, 74 percent farmers reported that the impact of changing weather on live stock rearing was shortage of fodder and 11 percent farmers reported shortage of pasture land.

Graph no.17- Impact of changing weather on livelihood

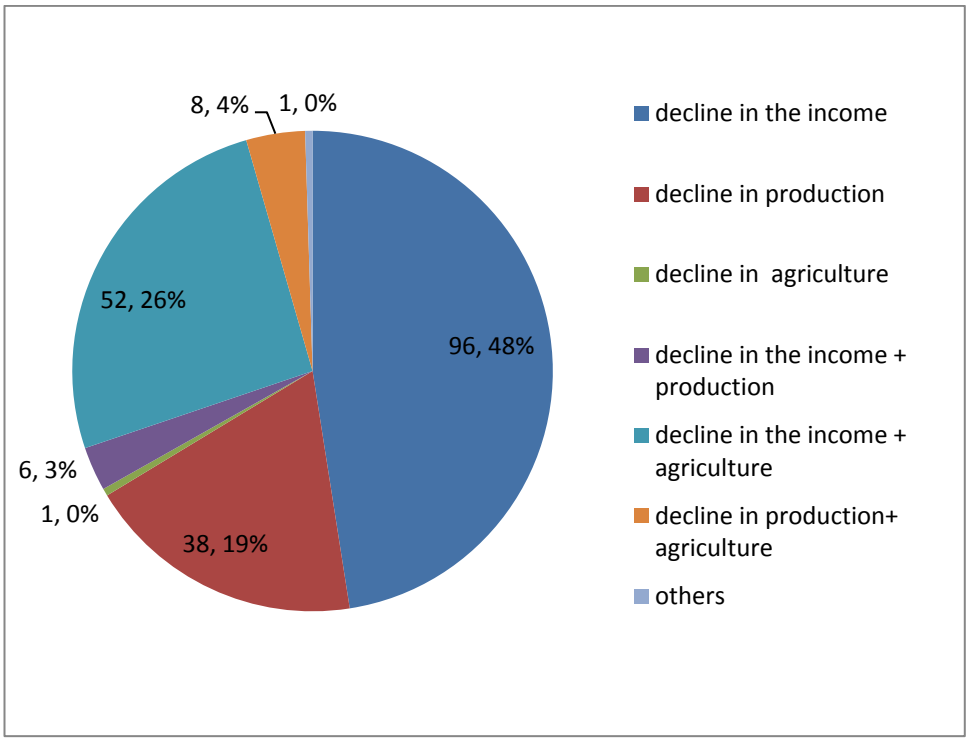


Table no15- Farmers perception on change in the health of the communities:

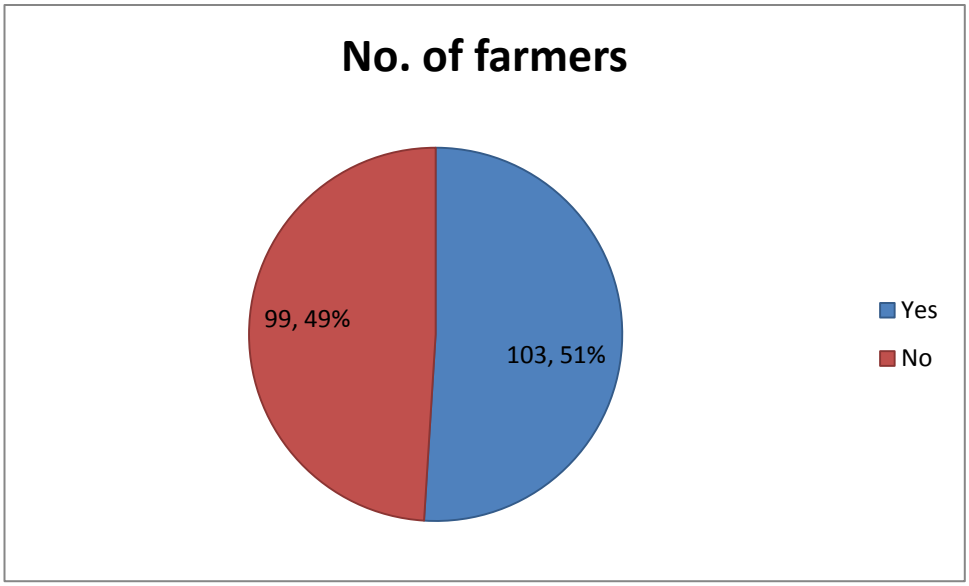
Type of Disease	Percentage	Frequency
increase in water related diseases	10	21
increase in air related diseases	5	9
increase in skin related diseases	3	6
increase in water related diseases+ air related diseases	3	6
increase in water related diseases+ air related diseases+ skin	3	6
increase in water related diseases+ air related diseases +others	1	1
increase in water related diseases+ skin	5	11
Don't know	9	18
others	61	124

According to farmers perception from above table we can interpret that, there were 61 percent farmers suffering from various disease like malaria, headache, eye burning, body ache, typhoid, skin diseases, stomach ache and fatigue due to change in weather and use of chemical fertilizers and pesticides.

According to farmers in some villages like Swangi, Saujana, Bori, Kawtha, Varudh farmers observed many cases of Cancer, Chicken pox, Paralysis, Kidney and various Heart problems, Asthma in last five years.

Due to high temperature there were some incidences of livestock diseases.

Graph no.17- In case of weather related catastrophes (droughts/delayed rainfall) farmers expecting any assistance from inside farmers own village/area:



From above graph we can explain that 51 percent farmers get some assistance from village or govt, but 49 percent farmers did not get any assistance.

51 percent farmers get help from government/ panchayat but farmers also reported that they were not getting enough money in comparison with crop loss and they get very less fodder for livestock.

Table no.16- Agencies active in villages:

Type of agency	Percentage	Frequency
govt owned institutions	1	2
non govt	4	9

organizations		
farmer cooperative	1	2
women group	40	80
govt owned institutions+ non govt organizations	1	2
govt owned institutions+ non govt organizations + farmer cooperative	.50	1
govt owned institutions+ non govt organizations + farmer cooperative + women group	12	25
others	41	81

40 percent farmers observed that only women group are active in their village, and another 40 percent had some other observations like Sahukar, Kasturbha Gandhi College, seed and fertilizer company representatives etc.

Table no.17- Farmer's access to agriculture training facilities in village:

Access	Percentage	Frequency
Yes	43	86
No	57	116

From above table it can be interpreted that more than fifty percent farmers reported that they were not getting any kind of training facilities in village.

Table no.18- Agencies involved in agricultural training programmes:

Agency involved in agricultural training	Percentage	Frequency
GO	17	33

NGO	29	39
religious organizations	0	0
GO + NGO	3	7
Others	1	2
GO + others	2	5
No access	58	116

It can be interpreted from above table that more than 50 percent farmers mentioned that there was no access of any kind of agencies for agriculture training programmes in villages.

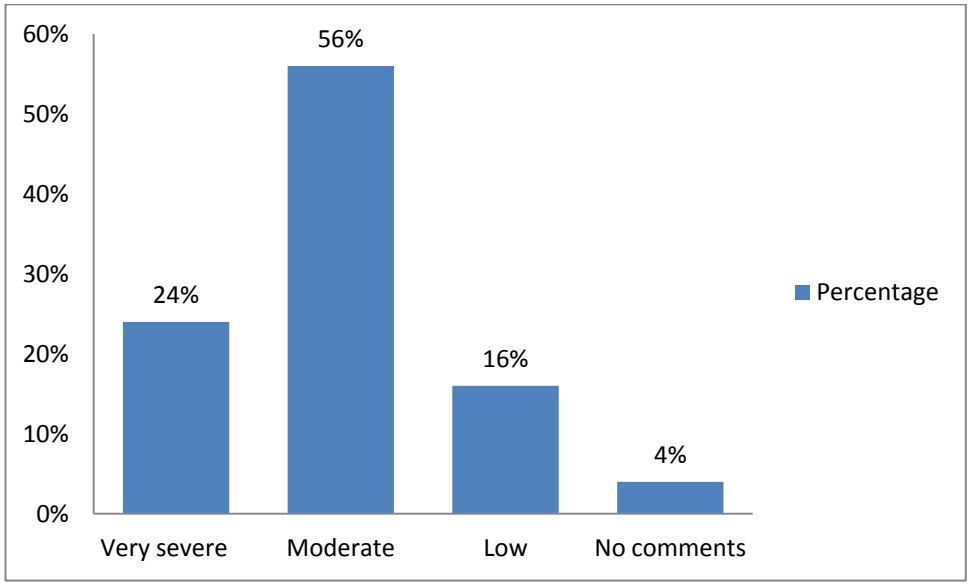
7.5. Farmer's Perception on influence of climate change:

Table no.19- Impact on agriculture overall (climate change):

Impact	Percentage	Frequency
Very severe	54	110
Moderate	43	86
Low	3	6
No comments	0	0

Table interprets that more than fifty percent farmers reported that impact of climate change on agriculture was very severe and also observed that Sorghum production was severely reduced in most of the villages (from 10 quintal to 3 quintal) , according to farmers ,it was severely affected by wild animals.

Graph no.18-Impact on biodiversity



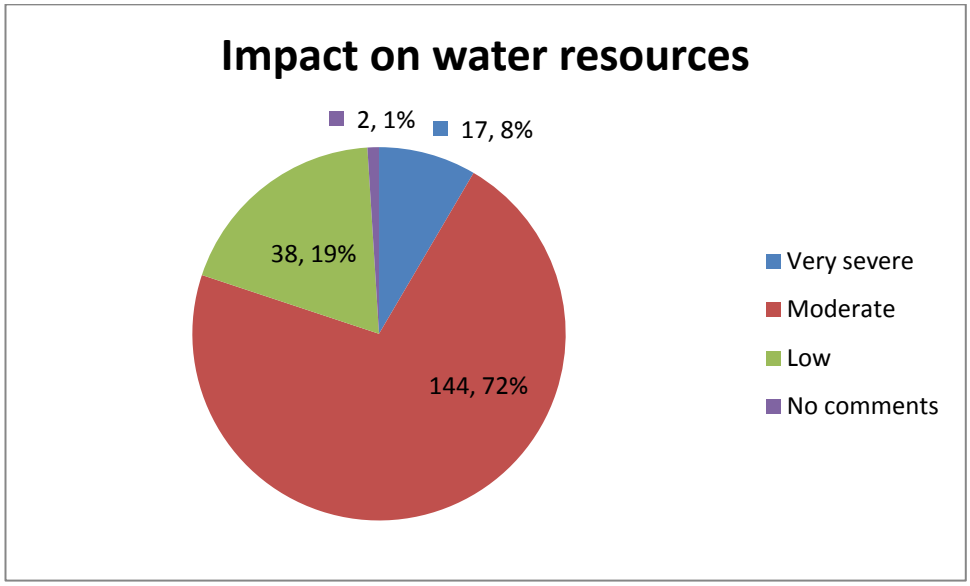
Majority of farmers (56 percent) reported that impact of climate change on biodiversity was moderate and 24 percent thinks that its impact on biodiversity was very severe.

Table no.20- Impact on soil fertility (climate change):

Impact	Percentage	Frequency
Very severe	14	29
Moderate	66	133
Low	19	38
No comments	1	2

Above table interprets that 66 percent farmers reported that impact of climate change on soil fertility was moderate. Some farmers observed changes in colour of soil and some observed excessive hardness in their land during last few years.

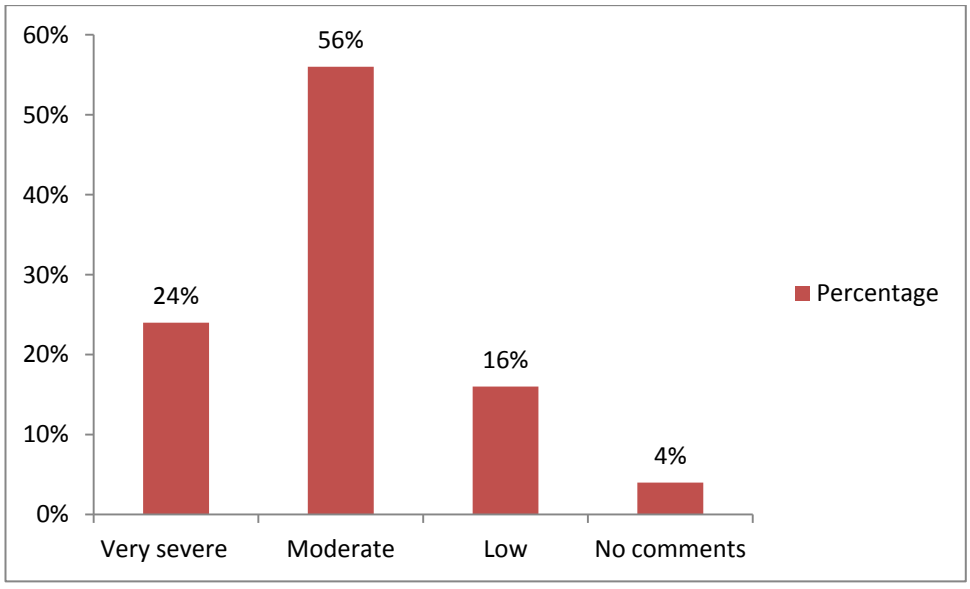
Graph no.19-Impact on water resources



The graph depicts that 72 percent farmers reported that impact of climate change on water resources were moderate and 19 percent and 8 percent farmers reported that its impact was low and very severe respectively.

Farmers also observed steep fluctuation in rainfall that enhancing the pest attack and ultimately crop production.

Graph no.19; Impact on crop yield



It can be interpreted from above table that 56 percent farmers reported that the impact of climate change on crop production was moderate and 24 percent farmers mentioned that its impact was very severe.

According to farmers Bt cotton's crop standing period was six months but now it was reduced up to 4 months. Length of Spike of wheat was decreasing and number of grains or kernels was also decreasing.

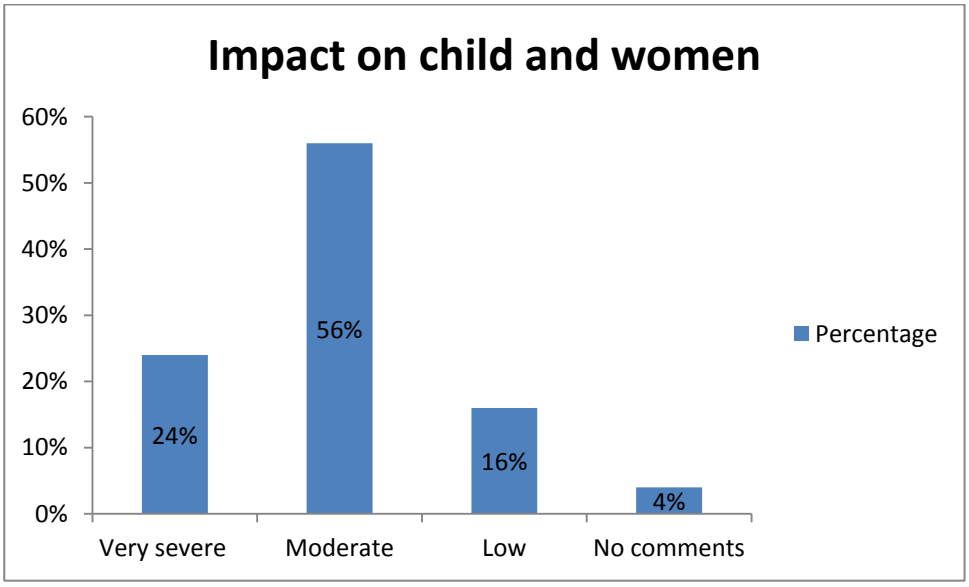
We also observed that chemical treated plants were of smaller length and lesser thickness.

Sometimes Excessive fog affected legume of Red gram and weed crops.

Table no21-Impact on food security:

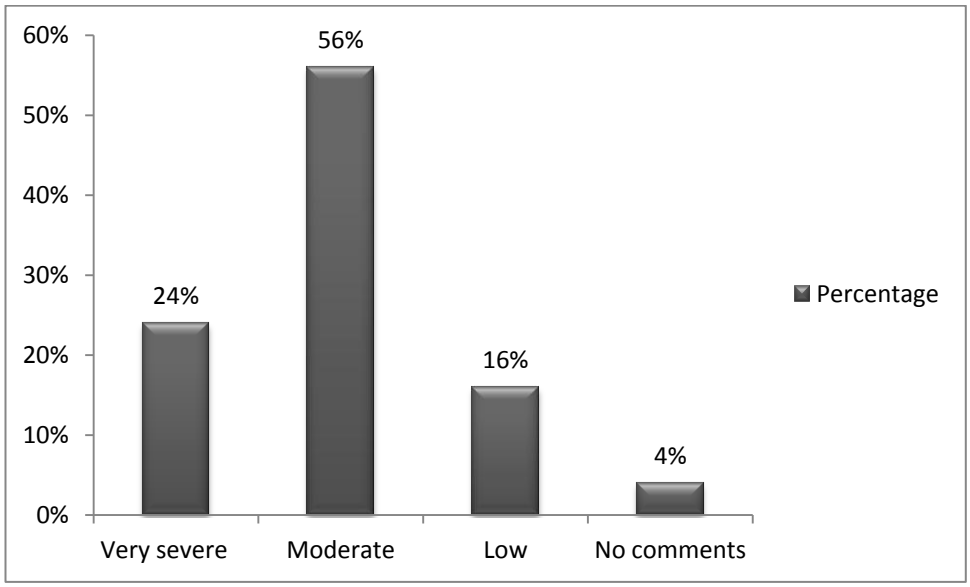
Impact	Frequency	Percentage
Very severe	3	2
Moderate	49	24
Low	103	51
No comments	47	23

Graph no.20-Impact on child and women



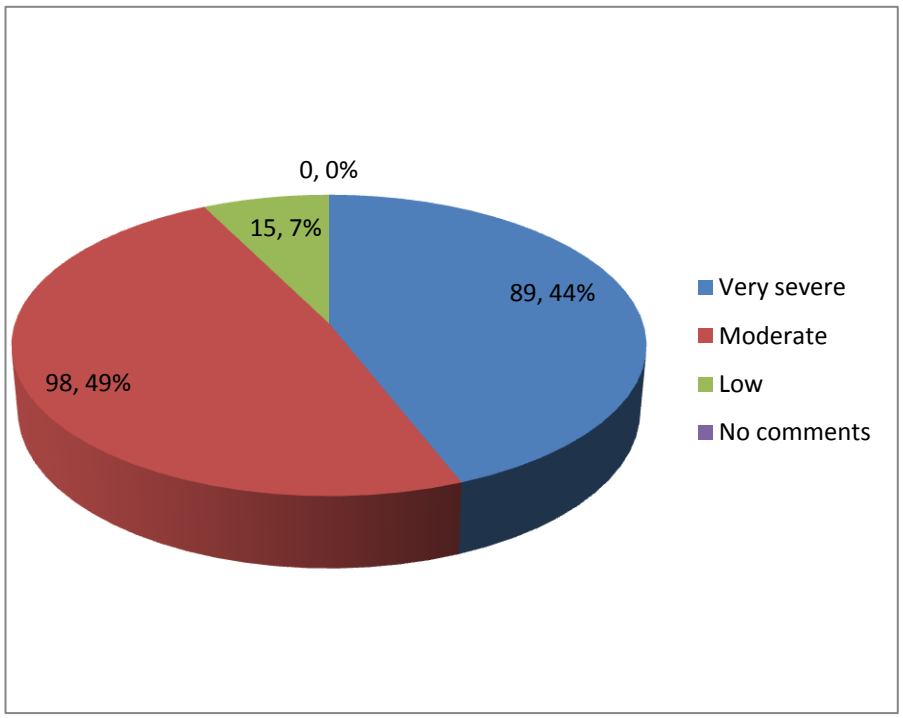
It can be interpreted from above table that 56 percent farmers mentioned that impact of climate change on child and women was moderate.

Graph no.21-Impact on farmers' income



It can be depicted from above graph that 56 percent farmers mentioned that impact of climate change on their income was moderate but 42 percent farmers mentioned that its impact was very severe in comparison others.

Graph no.22-Pest disease occurrence



It can be interpreted from above table that 49 percent farmers reported that pest disease condition was moderate but 44 percent famers reported that pest disease condition was very severe due to climate change in comparison others.

Table no.22- Migration of farmers:

Impact	Percentage	Frequency
Very severe	3	7
Moderate	1	1
Low	65	131
No comments	31	62

According to farmers' perception, it was observed that from above table the migration of farmers were low (65 percent) in the village of Vidarbha region and three percent migrated for better livelihood.

Chapter 8

SECONDARY DATA ANALYSIS

8.1. WARDHA

KHARIF CROPS FERTILIZERS (IN TONN.)

Table no.23-

column	Fertilizer type	Year			
		2008	2009	2010	2011(in planning)
1	UREA	23460	13210	20692	25000
2	DAP	15130	22075	19453	32000
3	SSP	7985	2300	5675	11600
4	MOP(MURATE OF POTESH)	4350	5644	6581	8450
5	MAP	-	1380	823	200
6	COMPOSITIVE	12974	12520	11020	14000

7	MIXTURE	8750	2925	5499	-
	TOTAL	72649	60054	69743	91250

From above table we can easily interpret that Kharif crop fertilizers consumption is increasing every year and it is ultimately affecting soil and increasing more dependency on chemical fertilizer manufacturing companies. The most worrying factor is that year by year price of fertilizers is increasing and it leads to more debt on farmers.

RABI CROPS FERTILIZERS

Table no.24

1	UREA	12912	9633	13013	15000
2	DAP	1970	4325	7120	9000
3	SSP	538	1169	1032	2000
4	MOP	2064	1134	3700	4000
5	COMPOSITE	3068	2707	5950	7000
6	MIXTURE	-	2565	1089	1000
	TOTAL	20552	21533	31904	38000

A cursory look at the table --- indicates that consumption of rabi crop fertilizers is also increasing every year.

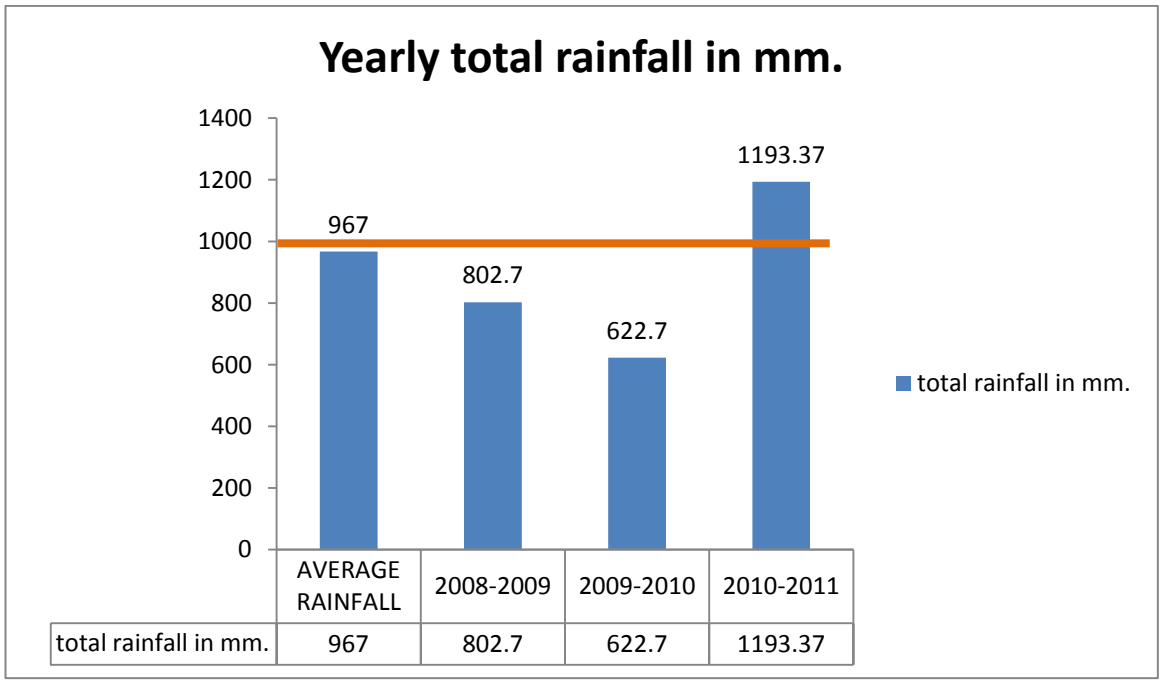
RAINFALL PATTERN

Table no.25

	MONTH	AVERAGE RAINFALL	2008-2009		2009-2010		2010-2011	
			ACTUAL RAINFALL	%	ACTUAL RAINFALL	%	ACTUAL RAINFALL	%
1	JUNE	171.40	97.40	57	84.00	49	152.87	89
2	JULY	321.50	331.60	103	270.40	84	415.50	129
3	AUGUST	245.10	187.90	77	150.60	61	361.90	148
4	SEPTEMBER	182.60	168.30	92	87.20	48	209.90	115

5	OCTOBER	46.40	17.50	38	30.50	66	53.20	115
6	TOTAL	967.00	802.70	83	622.70	64	1193.37	123

Graph no.23



It can be interpreted from above table that the average rainfall in wardha district was 967 mm. and total rainfall in the year 2008-09 was 802.7 mm and in the year 2009-10, it was 622.7 mm. so rainfall decreased a lot but in year 2010-11 rainfall crossed average rainfall and reached to 1193.37 mm. From this table we can conclude that there was huge change in rainfall pattern.

8.2. YAVATMAL

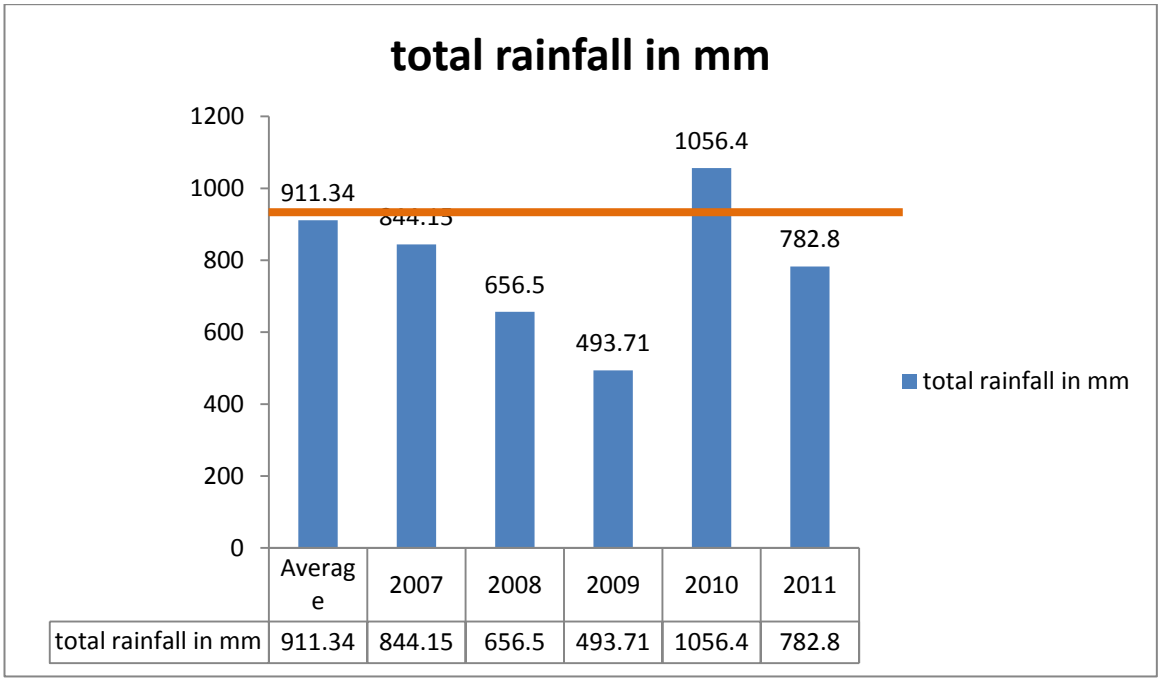
RAINFALL PATTERN

Table no.26

NO.	YEAR	MONTHLY ACTUAL RAINFALL					ACTUAL	AVERAGE	%
		JUNE	JULY	AUGUST	SEPTEMBER	OCT.			
1	2007	183.15	259.00	173.00	229.00	0.00	844.15	911.34	92.63
2	2008	89.36	191.65	204.80	147.42	23.27	656.50	911.34	72.04
3	2009	99.15	140.60	123.17	111.25	19.54	493.71	911.34	54.17

4	2010	120.70	413.90	363.40	146.40	12.00	1056.40	911.34	115.92
5	2011	159.20	248.60	235.10	135.20	4.70	782.80	911.34	85.90

Graph no.24



From above graph we can easily interpret that average rainfall in Yavatmal district is 911.34 mm but from the year 2007 to 2009 it decreased consecutively nearly to just half of average rainfall (493.71 mm).

Interestingly in very next it crossed the average total rainfall at reached to 1056.4 mm and in the very next year (2011) rainfall was again below the average rainfall (782.5 mm). It clearly gives idea of high uncertainty of climate.

Chapter 9

Farmers voice on climate change

Below are mentioned some examples of voices from the farmers with whom we had interacted during the study. These tell us the depth of experience

- ✓ Shyam rao harbaji bhoyar of Khudantpur village quotes that "Pehle *lagataar aath din tak baarish hoti thi ab to kuch bhi bharosha nhi h" (Some years back rainfall was continues for eight days but now a day's rainfall is unpredictable).* He also told us that water holding capacity of his farm land decreasing in last few years.
- ✓ Vaman kule of Khudantpur village also quotes that we are imparting in climate change by cutting forest trees that leads to low rainfall and in future there will be no woods as fuel energy source so we will be dependent only on LPG.
- ✓ Dhanraj murlidhar of Narsula village tells us from his 20 years farming experience that *"….cotton matlab dose…" (..High amount of fertilizers can only give high cotton production..).*
  He also told us that"…Pehle hamre gaanv mein ek hazaar jhaad the ab to sirf paanchso he honge…en jhaado se thand rehti thi…" (There were approximately one thousand plants in the village but now only five hundred left…and trees were source of maintaining environment cool…).
  From this quote we can easily understand that number of trees is decreasing due human activity it affects biodiversity and imparts negative impact on climate.
  He also observed that new pests are attacking crops like Churada, Murada (Sucking pests), Army worm, White Fly, Untalli.
- ✓ Narendra Vishwesvarrao Gurde of Peth village also told us that, now water level in our village is at thirty five (35) feet and ten years back it was around twenty five (25) feet. From this we can understand that water level is decreasing very fast.
- ✓ Wild animal attack is one of the major issues of all the villages we had visited. The possible reasons behind increase in wild animal attack may be decrease in forest area and lack of availability of food sources in decreased forest area.
- ✓ Vitthal rao bhute of khshirsamudra village told us that due to high temperature cottons crop and due to high rainfall soybean crop are destroyed.
- ✓ Prashant gulabrao lohekar also told us that although rainfall is decreasing but it also depends upon Nakshatras (Nakshatras are one of the oldest references that were used in the ancient time to predict rainfall pattern).

Pictures showing Animal Behaviour

- ✓ Some farmers also told us that there are some animals which make nests on the margin of tree if there will be less rainfall and make nests near the stem if there will be more rainfall in coming season.

Chapter 10

LEARNINGs

- ✓ How to sustain agriculture by NPM methods
- ✓ Practical exposure of FGD and PRA techniques
- ✓ Challenges in agriculture in Vidarbha region
- ✓ Organization culture

Chapter 11

RECOMMENDATIONS

A. Farmers should be made aware about harmful effects of excess use of fertilizers, pesticides and herbicides and their effect on soil, crop and their own health as well.

B. Farmers have irrigation facilities (river or canal) available at some distance but don't have access to that water because of unavailability of money for purchasing motor pump. So government should take steps regarding this. It is more important because government invest huge amount in making canals and some other projects but it is not worth doing unless this water is in reach of farmers.
We are also little worried because there are many projects still going in the studied villages, so farmers will get water from these or not??

C. There should be a farmers Agri-group in every village, in this group farmers share their agriculture related problems and their possible solutions. This group can go to agriculture officers for help or can raise issues in front of panchayat or at upper level.

D. 98% farmers accepted that soil fertility of their land is changing from last 5-15 years and soil samples were sent to respective authorities but they didn't get any soil reports. This issue was found almost in every village, so government/ agriculture department/ organizations should address this issue and solve this major issue because this can also increase confidence as well as crop production.

E. Given the trend towards deteriorating health of livestock, falling productivity of milk in last few years there is a need to relate this to the adverse effects of climate change.

F. Some farmers have calcinated soil that's why their land is unproductive; crop production is irrespective of how much fertilizer was used. So govt can provide alternative land or can do some special interventions.

G. Some farmers were given expired seeds by Krishi Kenda, the govt agriculture shop. These seeds didn't germinate which affected crop production leading to more indebtedness. We should ensure

that they get good quality of seeds. Seed storage pattern (especially Soybean) can be taught to respective people like Krishi Kendra etc.

H. Big farmers don't give any assistance or help to marginal farmers like not giving water even after offering money in return of it. There is a need to work on social awareness about helping each other.

I. In some villages the storage structures for drinking water have water un suitable for drinking purpose of human being. It is only used for livestock…!! Strict action should be taken against responsible persons for it because they are wasting so much money. We are even worried that what happens with livestock when they drink this polluted water.

J. There was a government scheme for doing farm bunding; it was a good scheme but still nearly 50% farmers don't practice such things. Farmers also want a subsidy scheme on this.

K. In Vidarbhaa region most of the farming practices depends on rain water and during rabi crop season they don't have any work to do. Government should implement some projects during this period so they can earn more income and six months can be best utilised for sustaining their livelihood.

L. Training given by agriculture department should be of more than one day and there should be proper monitoring and evaluation of this training.

M. Government, health agencies and organizations should do in-depth study on impacts of climate change and chemical fertilizers, pesticides and herbicides on health of farmers.

N. Farmer's suggestions:

- Due to attack of wild animal such as Neelgay, Rohi, and Wild pig, agricultural crops are destroyed. Crops like Groundnut and Jowar totally eaten by wild pig. 20 - 25 % of crops are damaged due to attack of wild animals. It is the major issue that we found in almost all villages of our study. Farmers want strict action against it and they compound for it or permission to kill these wild animals.

  Our suggestion is that Forest department should either make separate pasture land for these wild animals and transfer these wild animals to this area or transfer these wild animals to sanctuaries.
- Farmers want agriculture training that reduces input cost.

O. Promote Bee keeping, Sericulture, and Poultry farming for income generation.

P. Some farmers observed that forest area is decreasing at very higher rate so in future there will be no wood available as a energy source due to this reason they will be totally dependent on LPG gas. So we should promote Bio gas plant.

Q. We should promote Non Pesticide Management (organic farming) instead of chemical farming to reduce impact of climate change on agriculture.

R. Government should ensure that benefits of all the policies reaches to all targeted beneficiary.

SUGGESTIONS FOR CSA

- CSA should consider that while selecting village coordinator, the person should be totally involved in farming and not in other income generating activity. This would enable him for giving proper attention to his farming and spare more time for interacting with other famers.
- In CSA there should be a performance appraisal of employees on certain scales for achieving organizational goals in better way.
- CSA should focus on communication and presentation skills of their coordinators for easily influencing farmers.
- Lack of coordination.

Chapter 12

Conclusion

Climate change is very critical issue in today's changing global environment especially in case of developing and under developed countries. Study on impact of climate change on agriculture is more important in case of countries like India where agriculture is largely dryland and is more susceptible to crisis. In addition to this Vidarbha region of Maharashtra has been facing acute agrarian distress leading to famer suicides in the last few years.

Climate change as realized through trends of temperature increase, changing rainfall pattern and change in period of six seasons in India. This climate change is result of high concentration of emission of Green House Gases like CH4, Methane, Nitrous Oxide and CFC-12. GHGs are released from excessive use of chemical fertilizers, pesticides and herbicides, mono culture cropping pattern, combustion of solid, liquid and gaseous fuels.

Climate change is directly contributing to crops loses which ultimately affects production (yield) in all crops. The impact of climate change on agriculture is vast because climate change is affecting agriculture through many ways.

Farmers are unable to measure the direct impact of climate change since they are not aware. There is an increase in crop yield but simultaneously input cost also increasing in terms of frequent application of fertilizers and pesticides (27.22 %). Farmers observe that yes crop production is increasing, it really doesn't matter how much chemicals they use for it. Climate change in Vidarbha region, there is gap between two rainy days due to this reason humidity increased. There is reason of increasing pest from severe to very severe attack, ultimately it affects agriculture; farmers use more pesticides to kill increased number of pests, this excess use of pesticide act as aid to climate change. So there is a cycle of these interrelated things.

Farmers also observed some unusual changes in their soil like change of soil color and excessive hardness in soil because continue use of chemical pesticides Some farmers have their own perceptions that this may be due to use of inappropriate chemicals; farmers reported that we don't have any other options besides using chemicals. ''It is an undiscerning competition of putting more and more chemicals and we have to win it.''

According majority of farmers impact on water resources is moderate and it is due to decrease in rainfall. It also affects ground water level as well. Due to decrease and uncertain pattern of rainfall, farmers also have lesser yield of crops.

There is indirect impact on human especially child and women as well. There is less social interaction between farmers and their children.

Due to impact of climate change, there is also decreasing in livestock number and milk production of animals..

In summary, we can conclude that Farmers felt the climate change leads to change in pattern of rainfall, loss of biodiversity (affecting ecosystem), change in temperature, change in incidence of pest attack and diseases, changes in lowering of water levels, changes in health status and milk production of livestock and human being. To cap the climax, all these changes have cavernous impact on agriculture.

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ANNEXURE

CSA Organization Profile:

CSA is a professional resource organization engaged in establishing models of sustainable agriculture working in partnership with NGOs and Community Based Organizations by scaling up the successes and engaging with the establishment for a policy change. CSA is registered as Trust in 2004 and has been registered with Ministry of Home Affairs under FCRA: 010230731

CSA believes in promoting sustainable agricultural technologies that are based on farmers' knowledge and skills, their innovation based on local conditions and their use of nature's products and processes to gain better control over the pre-production and production processes involved in agriculture. CSA works with farmers to conserve their resources and their rights.

The main objectives of the organization are:

a. To improve the quality of life of farming communities by promoting environmentally safe and sustainable methods that would enhance the quality and quantity of crop yields especially in dryland areas.
b. To enhance the participation of farmers, both women and men, in all processes of problem analysis, technology development, evaluation, adoption and extension leading to food security and self reliance among farmers and rural communities.
c. To facilitate community access and control over natural resources and to build institutions and coalitions at different levels for strengthening People's Agriculture Movements, which focus on empowerment of marginalized sections like Women, Dalits, Adivasis and Minorities.
d. To develop a Sustainable Agriculture Resource Network that promotes sharing of knowledge, material and human resources. To serve as a repository for documenting, collecting, storing, collating and disseminating information/success stories from different sources on sustainable agriculture.
e. Understand the role of agriculture in contributing to climate change and developing sustainable agriculture practices which can help in mitigating and adapting to climate change. i

As part of this, CSA promotes NPM approach [Non Pesticide Management] to pest management, sustainable soil fertility and productivity management, non-chemical disease management and Seed Production & Management as integral technologies of sustainable agriculture. These approaches are mostly based on management practices to be adopted by farmers in their farming and often are driven by social and political perspectives and realities.

CSA is involved scaling up of sustainable models of agriculture through various development agencies and accessing markets. The model developed as 'Community Managed Sustainable Agriculture is today practiced in more than 2 million acres (10 % of cultivated area) in AP through Federations of Women Self Groups.

CSA is also engaged in establishing and working with Community Based Institutions to address their agriculture based livelihoods. Today CSA and its partners works with 20 farmers cooperatives and a consumer cooperative and their Federation which helps farmers in planning, producing and marketing their produce.

CSA is also engaged in policy advocacy work mainly on the impacts of chemical and GM technologies, their regulatory systems, public support systems to small and marginal farmers and revitalizing rainfed agriculture.

CSA is actively engaged with the government and people on the agriculture and climate change debate. The national mission on sustainable agriculture is largely based on the models developed and established by the organization.

Current area of work: Currently CSA is working in Andhra Pradesh, Maharashtra and Punjab directly in 130 villages and provide technical support to organizations in Orissa and Karnataka.

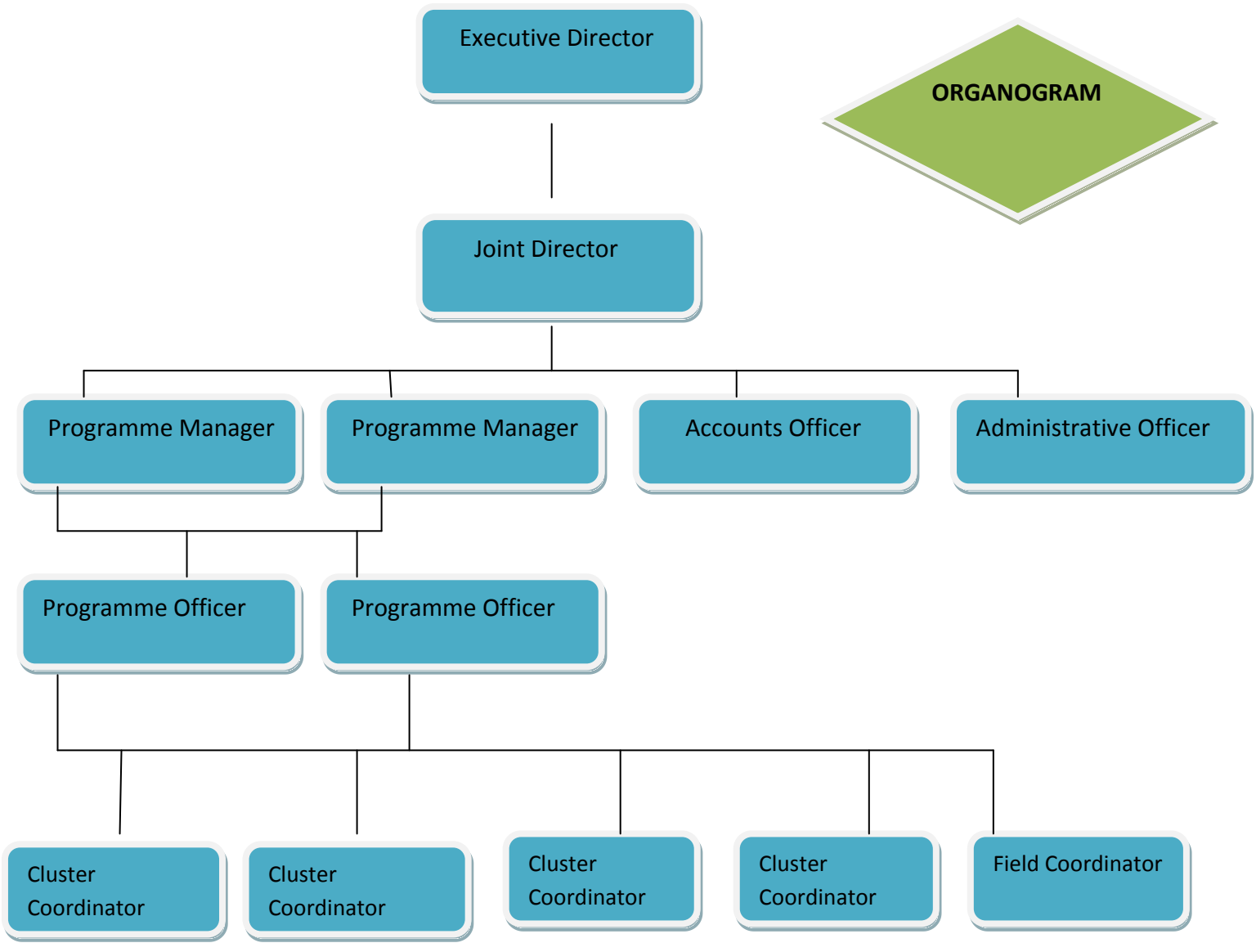
In the next five years CSA is planning to work in high resource intensive farming areas like the irrigated belts of AP and Punjab along with tribal farming areas like Chhattisgarh, Jharkhand and Orissa in addition to rain fed areas in Andhra Pradesh and Maharashtra in sustaining their livelihoods and farming.

Organizational Structure:

Board of Trustees: This Board consists of eminent agriculture scientists like Dr M S Chari, Retd. Director of Central Tobacco Research Institute; Dr N K Sanghi, Ex-DDG, MANAGE; Shri Devinder Sharma, noted agriculture trade policy analyst; Dr Ranga Rao, Scientist with ICRISAT; Dr Ramadevi Kolli, ICRISAT; Ms Kamla Bhasin, noted women's rights activist and formerly with the FAO; Ms Anuradha Prasad, HRD specialist.

There is an Executive Council consisting of representatives of both staff and Board members. This Council meets more frequently than the Board.

The team is led by the Executive Director, Dr G V Ramanjaneyulu who is an agriculture scientist and was with the Indian Council of Agriculture Research (ICAR) earlier. There is a Joint Director, Dr Raghunath. There are Project Managers and Project Officers, where work responsibilities are shared project-wise (specializations included such as seeds, pest management, disease management etc.) as well as for particular geographical areas. The organization also has support staff in the form of an Accounts & Administration Officer and Office Assistants.



NON PESTICIDE MANAGEMENT (NPM)

The emerging new paradigm of sustainable agriculture shows that the new knowledge synthesized from traditional practices supplemented with modern science can bring in ecological and economic benefits to farmers. The institutional base of community base organizations like federations of women self help group provides a good platform for scaling up such ecological farming practices. The cost of cultivations could be brought down significantly without reduction in yield.

Non Pesticide Management of crop pests to reduce the cost of cultivation by adopting a set of practices based on farmers knowledge supplemented by modern science which makes best use of local resources and natural process by the farmers and women self help group. The saving in cost of cultivation on pest management ranged from 600 to 6000 per hector without affecting the yields. Most of the chemical pesticides are used to kill the pest when it is in the most damaging stage of life cycle.

The regular use of pesticides creates pressure and result in the development of genetic resistance in the insects and makes sprays more and more ineffective

Natural Disturbance-Rice brown plant hopper eggs are laid within the rice stalk and shielded from spray and spraying they hatch into a field free of their natural enemies. Systemic pesticides can kill the early neutral insects which lure the first generation of beneficial and kill the beneficial as well. This ecological disturbance result in pest shift.

Some examples of Non-Pesticide Management techniques include:

- Introduction of natural predators.
- Use of naturally occurring insecticides, such as Neem tree products.
- Use of trap crops which attract the insects away from the fields. The trap crops are regularly checked and pests are manually removed.
- Pest larvae which were killed by viruses can be crushed and sprayed over fields, thus killing the remaining larvae.

Over years insects have withstood natural calamities and survived successfully. Hence they are able to develop resistance to the extremely toxic chemical pesticides insecticides used by farmers. To be successful, farmers should be knowledgeable and able to identify various crop pests, and their natural enemies (farmer's friendly insects). Farmers should recognize different stages of insects and their behaviour. The efforts to minimize pests should aim at restoring the natural balance of insects in crop ecosystem but not elimination of the pest.

Principles of NPM-

Encouraging natural process in environment

Crop ecosystem should be diverse by growing inter crops, trap crops, border crops in place of mono cropping. Once the insecticide sprays stopped, natural enemies of crop pests gradually establish and exercise control of crop pests, which can be enhanced with botanical extracts like NSKE, chilli garlic extract, cattle dung urine decoction etc.

Management skill

Selecting crop based on soil, water resources, climate and local pest problems that occur regularly, crop rotation, adjustment of sowing dates to avoid endemic pests, setting up light and pheromone traps, keeping sticky traps and bird perches.

Local resources

Using locally available organic amendments for soil improvement and pest control. The extracts are prepared and used as prophylactic or curative measures aimed to restore the disturbed natural balance.

Labour

Shunning chemical inputs and out of shelf products farmer should invest his labour as main investment like regular monitoring of the crop and following methods like deep summer ploughing and shaking plants to dislodge pod borers in pigeon pea.

Community approach

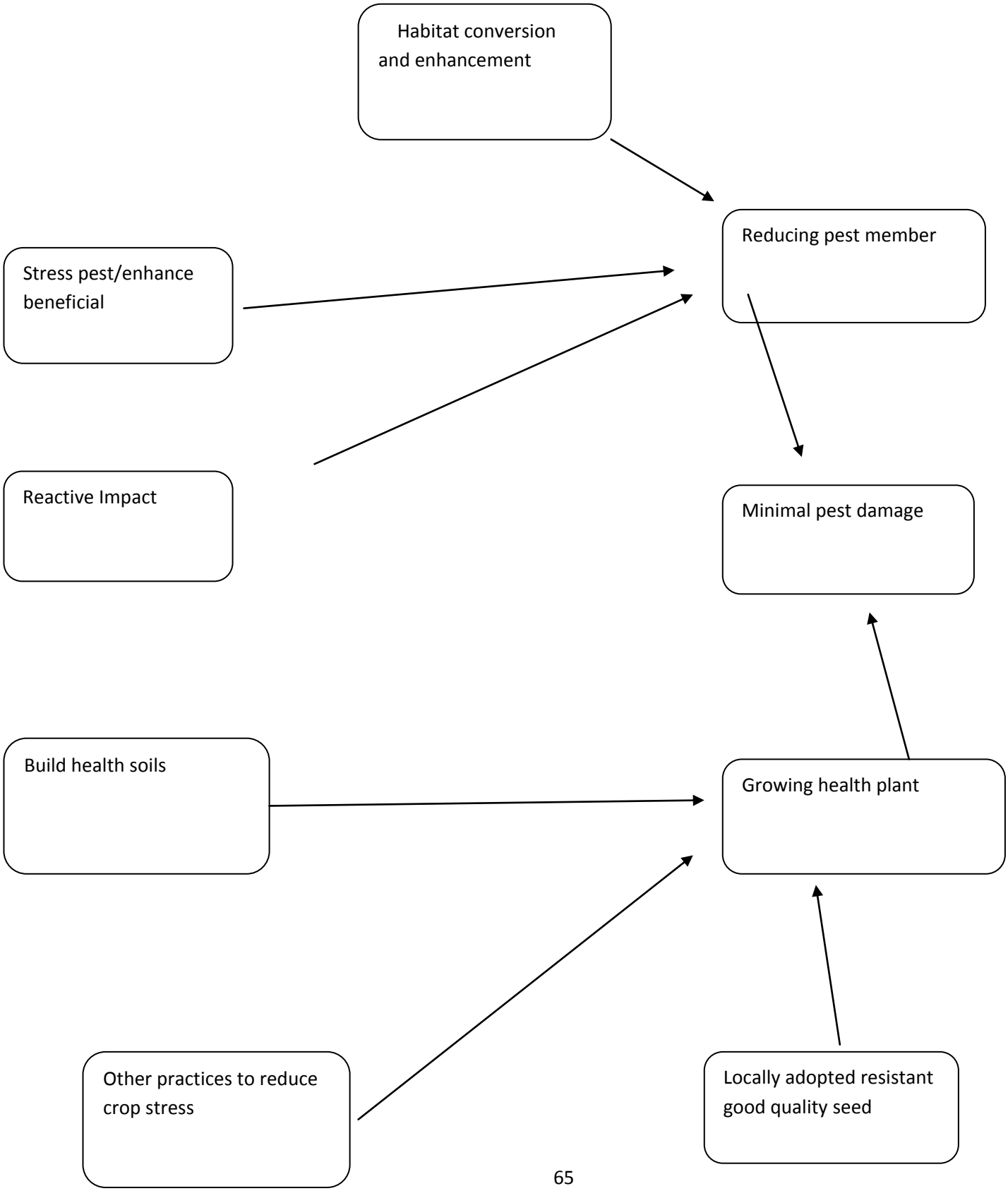
Pest problem of a farmer not only depends on the crop and management practices of one farmer in isolation. To a large extent it depends on crops cultivated by neighbouring farmers and measures taken by them. Hence, identification of activities that necessitate group action and implementing them would be most important aspect in NPM /sustainable agriculture.

PESTICIDES AND ECOLOGICAL IMPACTS-

- ✓ The chemical pesticides leave larger ecological foot prints in manufacturing storage, transport and usage polluting the soils water and air.
- ✓ Some amounts of pesticides used in crop production appear as residues in the produce these residues in food, soil and water enter into the food chain and causes serious health problems to human beings and other living beings.
- ✓ The pesticide residues are even noticed in human milk (DOWN TO EARTH,1997)
- ✓ The pesticide residues in soil can kill the soil microbes there by effect the soil fertility.
- ✓ Common pesticides block the chemical signals that allow nitrogen-fixing bacteria to function

GRAPHICAL REPRESATION OF NON PESTICIDE MANAGEMENT-

NPM involves adoption of various practices which prevents insects from reaching to damaging stage and proportions, like rice blast or beeyamrut to induce microbial activity in the soil and kill any seed borne pathogens.



2. **QUESTAIONARE-**

Study ON IMPACT OF CLIMATE CHANGE ON AGRICULTURE

(NOTE: - The information given by the farmer shall be treated as confidential and shall be used only for purpose of this survey)

Questionnaire

1. **Identification of Household /Respondent**
   a. Date of Interview
   b. Name of respondent
   c. Village
   d. District
   e. State

2. **Basic Social Data**

   a. How many people are normally in this household?

   b. How long have you been Farming?

0-5 years	5-10 years	10-20 years	20-30 years	More than 30 years

3. **Land and Land Use data**
   a. Total Farm size
      1. 1 to 2.5 2. 2.5 to 5 6 to 10 more than 10 acre

   b. Area used for Farming crops **c.Fodder production**

4. **Land resources**
   a. Where is the majority of your land located?

      1. Hilltop 2.Hill side 3. Valley 4. Swamp 5.Plain
   b. In general, how would you describe the fertility of your soil?(cotton, soya)
      1. Very high 2High 3.Medium 4.Low
   c. How would you tell the fertility of your soil? Is there any method to check the fertility of soil
      ---

d. Are there any changes in the fertility of your soil in the last years?

1. 5-15 years2. 15-25 years 3. 25-30 years 4. More than 50 years

e. What are the main causes of declining soil in your land?

1. Use of chemical fertilizers 2.Deforestation

3.Soil Erosio 4.Mono-cropping 5.Others specify

5. Water resources:

a. Is sufficient water is available in your region

1**.** High availability 2. Medium 3. Low 4. Not available

b. What are the sources of water for human being-consumption?

	Ponds&Wells	Bore wells	Canal	Piped water	Hand pumps	others
Human						
Agriculture						
Livestock						

c. What are the sources of water for Agriculture:

1. Rain water 2. Canals 3. Bore Wells 4. Others

d. Were you short of water for crops and livestock in the past years?

1. 5-10 years 2. 10-20 years 3. 20-30 years 4. More than 30 years

e. What could be the reasons for the shortage of water in your region?

1. Low Rainfall 2. Loss of forest tress

3. No proper storage of rain water 4. Others(Specify)

f. How do you adapt to such water stress conditions in your region?

g. Is the water available for Agriculture adequate, If not then what is lacking?Please list

1. No canals 2. Bore wells not working

3. Low Rains 4. Other(Specify)

h. What does you do when there is water storage?

i. What are the traditional cop mechanisms to conserve the water in your region?

1. Rain water harvesting
2. Conservation of water in the Agriculture fields by farm bunding

3. Construction of farm ponds

4. Others(Specify)

6. Farm Management

1. What are the major crops grown during the monsoon seasons?
2. What are the major crops grown during winter seasons?

a. What forms of agriculture do you practice?

1. Mono cropping 2. Mixed cropping 3. Agro horticulture

4. Agroforestry 5. Others

b. Do you see any advantages in mixed cropping as opposed to mono cropping or vice-versa, if yes, please list

c.What type of seeds do you use in the agriculture?

1. Seeds from agriculture institutes 2. Seeds from the market

3. Seeds conserved at home 4.Others

D.What type of fertilizers are you using in the agriculture?(%)

1. Fertilizers from the agriculture research stations
2. Fertilizers from the market
3. Use of cow dung as fertilizers
4. Green manuing by growing crops such as Sun hemp. Daincha
5. Others

7.Climate change awareness

a. What do you understand about the climate or weather?

1. Rainfall 2. Temperature 3. Winds

4. Or combination of all the above 5. Not known

b. Have you observed any changes in the following for the last 20 years

1. Changes in rain fall pattern 2. Changes in temperature

3. Sudden extreme events 4. Changes in seasons 5. Others

c. Have you observed any changes in the rainfall in the last 20 years

1. Increase in rainfall 2. Decrease in rainfall 3 Changes in the rainfall intensity

4.Untimly rainfall 5.Delayed monsoon

6.No of rainy days 7. Others

d. Have you observed any changes in the in the temperature in the last 20 years?

i. Increase in temperature ii. Decrease in temperature

iii. Overall increase or decrease in night temperature iv. Increase in winter temperature v. Any other observation

e. Did you experience ultimately extreme event, in the last five years?

i. Longer drought Heavy rainfall ii. Ultimately dirt storms

iii.Ultimately hail storms iv.Others

f. What will you do if extreme weather events should appear more frequently in the years to come?

i. Will face the changes ii.Will migrate to other regions

iii.Will use traditional practices to cope iv.Others

g. Could you pls explain the four major adaptive measures that farmers are already using when drought conditions prevail in the region?

i. . ii.

iii. iv.

h. The changes in weather conditions (if there were any) in your region have which major impacts in your opinion?

i. Impact on agriculture ii.Impact on water

iii.Impact on livelihood iv.Impact on livestock

v.Impact on human health vi.Others

i..Do you observed any changes in the average crop yields in the past 20 years caused by changes in weather conditions

i. Increase in crop yields ii.Decrease in crop yields

iii.Increase in pest attack iv.Increase in crop diseases

v.Other(specify with examples)

j. Which crop/crop variety/cropping pattern were least affected due to changes in weather? Give the details of crops, crop variety and cropping pattern

i. Local variety(farmer's variety)

ii. Hybrid varieties(from the research stations)

iii. Mono cropping

iv. Mixed cropping

v. Rain fed crops

vi. Irrigated crops

vii. Others

k. Can you give three major crops that are most resilient to drought in your region?

i. .

ii. .

iii. .

iv. .

l. How would you describe the incidence of crops pests and diseases on your farm due to changes in weather in the last 20 years?

i. Very severe ii.Severe iii.Mild iv.No incidence

m. Could you pls explain the reasons for the increase in pest or diseases?

i. Increase in temperature ii.Decrease in temperature

iii.Increase in rainfall iv.Decrease in rainfall v. Others

n. Is there any adaptive measure to crop pest/disease that you are already practicing in your area?

i. Using bio pesticides ii.Using traditional methods(give examples)

iii.Not such practices available iv.Others

o. What type of storage facility do you have to store your crops after harvesting

i. In the house ii.In the open

iii.Granary iv.No storage facility

ii. Others(give example)

p. Reasons for post harvest crop losses in the last years due to weather events? Could you give us the details?

i. Ultimately rains ii.Ultimately storms

iii.No storage facility iv.More pest attack v.Others

q. Is the situation worsening? Do you have some plans or alternatives to solve this problem? Prioritise three important alternatives:

i. .

ii. .

iii. .

r. What type of live stock you have been rearing?

i. Milk producing(give names)

ii. Meat producing(give name)

iii. Others (specify)

s. Do you observed any impact of the changing weather on live stock rearing?

i. Shortage of fodder ii.Storage of pasture land

iii.Storage of water iv.Any other (specify)

t. If yes, how do you overcome this problem of shortage of fodder? Could you give at least three examples?

i. ii. iii.

u. What are the traditional methods do you adopt to feed your cattle when there is a shortage of fodder. Could you us examples?

1. 2. 3. 4.

v. What is the overall of changing weather in your region on the livelihoods?

i. Decline in income ii.Decline in agriculture production

iii.Decline in milk production iv.Migration to other regions

ii. Others(specify with examples)

w. Have you observed any changes in the health of the communities due to change in weather?

i. Increase in water related diseases ii.Increase in air related diseases

iii.Increase in skin related diseases iv.Others(specify)

8. What would you propose to solve this problem?

i. Support within communities(family members)
ii. Support from govt and other agencies
iii. Capacity building of the communities iv.Other (specify)

9. Social capital-self help mechanism of the village/area

a. In case of weather related catastrophes (droughts/delayed rainfall etc.) can you expect any assistance from inside your village/area?

1. Yes 2.No

b. If yes, what form of assistance, explain?

10. Which agencies are mostly active in villages?

i. Govt owned institutions ii,Non govt organisations
ii. Farmer cooperative
iii. Women groups
iv. Others (specify)

11. Do you have access to agriculture training facilities in your village?

a. Yes
b. No

12. If yes, what are the agencies involved in such programmes

i. Govt owned institutions
ii. Non govt organizations
iii. Religious organizations
iv. Others

13. In your opinion what is the most urgent need of your community regarding the topic discussed above (weather and agriculture)? What kind of external help would you like to get? Prioritize:

i. .
ii. .
iii. .
iv. .

14. Farmers Perception on influence of climate change and adaptive measures regionally:

Activities	Impact			Adaptive measures
	Very severe	Moderate	Low	
Impact on agriculture overall				
Impact on biodiversity				
Impact on soil fertility				
Impact on soil fertility				
Impact on water resources				
Impact on crop yield				
Impact on food security				
Impact on child and women				
Pest disease occurrence				
Impact on farmers income				
Migration of farmers				

DEPARTMENTS VISITED

S	**Name of the Department**	**Date(s) of visit**	**% of time spent**	**People met (with designation)**
1	Agriculture Department,Wardha	-	1hours	Agriculture development officer(ADO)
2	Agriculture Department,Yavatmal	-	30 min	Agriculture development officer(ADO)
3	Seed certification department,wardha	-	30 min	Seed certification Office In charge
4	Krishi Vigyan Kendra	14 may	30 min	-
5	MSSRF,village resource centre,Yavatmal	14 may	30 min	In charge of VRC